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JOURNAL of FORESTRY

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EDITORIAL

IN BEHALF OF NATIONAL FORESTS

IN CONSIDERING the arguments advanced by the State Forester of Maryland concerning National versus State Forests, it is well to bear in mind that the National Forests today constitute forestry's one really outstanding accomplishment in the United States. Optimists may point with pride to the public's almost universal acceptance of forestry as an abstract principle, to the widespread establishment of state forestry departments, and to the growing appropriations for fire control, forest research, and other desirable purposes. Pessimists may view with alarm the growing area of idle forest land and the widening gap between production and consumption. The fact remains that the optimists would find it much harder to whistle cheerfully and the pessimists would find it much easier to paint a still more doleful picture were it not for the National Forests.

This is not to say that the National Forests are perfect. Fire control, methods of cutting, the regulation of grazing, the handling of recreation, and other activities still leave much to be desired. Forest officers are human and therefore make mistakes. Nevertheless, magnify the shortcomings of the Forest Service

as you will, it is true that the National Forests are the only relatively large body of forest lands in the country which are under competent technical management with permanence of productivity as a primary object.

Let us give all credit to the states, counties, and towns which are adding each year to the area of forest land in public ownership, and to the private owners who in the face of serious economic difficulties are trying to practice better silviculture and more effective regulation. But let us not forget that the sum total of all these areas now constitutes, and for many decades is likely to constitute, only a small fraction of our total forest area.

State ownership and public control of private cutting have been suggested as the remedies for this situation. Both have their merits, but history gives little reason to hope that either will be fully effective. The present temper of the American people apparently favors less rather than more government in business; leading foresters are not agreed as to the theoretical desirability of government control; and even if drastic legislation of this sort could be passed its enforcement would be beset with many difficulties. At its best, public

control of cutting on private lands could hardly be expected to result in as good silviculture as on land owned outright by the government. Mandatory private forestry may well be part of the answer to our forest problem, but it can hardly be the whole answer, particularly in the immediate future.

Increased state ownership of forest lands is highly desirable and almost universally approved by foresters. Few, however, see any possibility of its expansion on a scale sufficient to meet the demand. In spite of substitutes, chemical utilization, and imports it is hardly conceivable that American civilization will not find a real need and a profitable use for all the wood that can be grown on all available forest land; or that the demand of an increasingly outdoor-loving population for forests for recreational purposes will not exceed the supply. These needs, both economic and social, can be met effectively and satisfactorily only by liberal public ownership of forest lands, not only in the far West but in the East as well. Experience indicates that financially and politically the task is too big to be handled by the states alone. Increased federal participation is imperative.

After all the United States *is*, not *are*, a nation. Steamship, railroad, automobile, and airplane have bound the states inseparably together. Maine is a neighbor of California, Idaho of Florida, both physically and intellectually. Whether Michigan's sand plains are reforested means much to Iowa; what happens to the forests of Oregon is

of vital importance to New York. From the standpoint of their influence on the wood supply, on streamflow, or on recreation the forests are a national asset.

States and nation can well cooperate in an effort to increase greatly the area of public forests. Neither alone is competent to meet the needs of the situation. Granted that farm forestry and industrial forestry will gradually engage the attention of private owners, there is still a vast area which for many decades, perhaps centuries, will be properly handled only if in public ownership. This may well include not only denuded and restocked land but also merchantable timber, as in the Waterville purchase and in parts of the Northwest where the transfer of considerable bodies of timber to government ownership might help to check the present tendency to overproduction.

Neither foresters nor the general public have yet visualized the program of public forest acquisition in large enough terms. We talk in millions of acres when we should talk in tens of millions. This will take money, but so will any worth-while activity. We pour hundreds of millions without complaint into battleships and cruisers. Why should we be less generous in an investment which is even more necessary for the national welfare and which will eventually return ample dividends?

The acquisition of public forests on a greatly enlarged scale, with adequate emphasis on National Forests, east as well as west, is urgently important.

STATE AND FEDERAL ACQUISITION OF FOREST LANDS IN THE EAST¹

By F. W. BESLEY

State Forester of Maryland

IT IS freely admitted that under private ownership much of the forest land of the United States has been devastated and that little attempt is being made to bring it back to productiveness. As to the remedy, however, we are far from agreement. Under our constitutional guarantees the private owner cannot be dispossessed of his property or restricted in the use of it without proper compensation. It therefore follows that the private individual must be compensated by some form of subsidy, if he is required to manage his property for the public interest, or if the public insists on the exercise of complete control, it must purchase the property at a fair price and assume entire responsibility. The public in this case may be either the state or the federal government.

The only excuse for public control is to safeguard public interests which under private control are suffering, or will suffer. Under present conditions timber growing is profitable to the private owner only on the more favorable sites, and wherever there is a reasonable prospect of the private owner working out the problem within a reasonable time, it is far better that he be undisturbed in his rights than be subject to federal or state domination.

On the other hand, there are large areas of forest lands on mountain watersheds where timber is the only crop that can be grown, but upon which, under present conditions, timber growing is not profitable and therefore not practicable for the private owner. These lands frequently have values for watershed protection and for recreation—public benefits upon which the private owner cannot realize, but which are of sufficient value to the public, in addition to timber growing, to justify public ownership purely as an economic measure.

Such areas do not, in the aggregate, represent a very large part of the total forest acreage, and with the rapid advance of private and industrial forestry practice the areas over which public ownership is necessary can be very much reduced over the estimates made some years ago. In fact, if adequate fire protection and fair taxation, both of which are a public function, were provided, much of the non-productive forest land in private ownership would become productive and the forestry problem, to a considerable extent, solved without public ownership.

If we must have public ownership what form is best? Should it be federal or state, or a combination? Back in 1911, foresters and public officials concerned in securing federal forestry appropriations were extravagant in their claims of results that would follow the passage of

¹ Presented at the annual meeting of the Society of American Foresters, New York, December 29, 1928.

the Weeks Law. It would provide a timber supply, protect watersheds, reduce floods, improve low water stages, prevent erosion, and what not. The country was stampeded into the enactment of this law, authorizing the federal government to acquire lands on the watersheds of navigable streams. It also authorized the expenditure of federal funds, in cooperation with the state's, for the protection of such lands from fire. This acquisition program was based on the premise that navigable streams are open to the use of everybody and are mainly interstate, and therefore the protection of their watersheds presented a national rather than a state problem.

Up to 1924 the federal government, under the Weeks Law, had acquired about 2½ million acres in national forests in the East. Under the Clarke-McNary Law of 1924, the provisions of the Weeks Law in regard to federal acquisition of lands were reenacted with this difference: In the Weeks Law, acquisition is limited to the *headwaters* of navigable streams, whereas in the Clarke-McNary Act, the term headwaters is eliminated and the scope of acquisition extended "to forests or forest lands within the watersheds of navigable streams." This act is being interpreted as giving authority for the acquisition of lands on any watershed of any navigable stream; in other words, there is practically no limit. It is even doubted by some whether a state Enabling Act is a necessary prerequisite, although any attempt to disregard it would be strongly protested.

Up to the end of the fiscal year 1927, 2,892,741 acres had been acquired, extending all the way from Maine to Arkansas, with, however, some notable gaps in the chain. In the meantime, what

were the states doing on their own account in the acquisition of state forests? Many of the forestry departments in the East were created prior to the passage of the Weeks Law in 1911, and in most, if not all, of the states the organic act which created the forestry departments provided for state forests. The entrance of the federal government into land acquisition, therefore, raised the issue in practically every eastern state as between national forests and state forests. The federal government set up, in states where acquisition was possible, certain areas embracing the best of the cheap forest lands that could be secured most advantageously and in large units, capable of economic administration. It was exactly the kind of land that would be most suitable for state forests.

What has been the result? In states where state forest acquisition programs were under way, and forest policies were sufficiently developed, the federal government found the door locked against it. On the other hand, in states which either had not yet organized forestry departments or where such departments were weak and struggling to build up an organization, having not yet reached a point where they could develop acquisition programs, the federal government was able to enter and set up national forests. The ownership and control of state forests gives any forestry department a measure of stability, initiative, and strength that it could not otherwise attain. It is a notable fact that the states which have gone farthest in the acquisition of state forests are today occupying positions of progressive leadership, while the states having national forests within their borders are struggling against heavy odds, and having great difficulty in mak-

ing progress. This is not altogether due to the presence of national forests, but such a condition is, I believe, a strong contributing factor.

Maryland, in common with a number of southern states, passed an Enabling Act many years ago, permitting the federal government to acquire forest land. She, however, repented of her youthful indiscretion and repealed this act two years ago, before any damage had been done.

The influences which persuaded the state to let the federal government enter as a landowner seemed very convincing at the time. It believed that public ownership and regulation of its forest land would bring desirable benefits and the use of federal money for the purpose would save the state much expense. It was pointed out that forest lands were being devastated by fire under private ownership and failing to meet the needs of the state and nation, which was true; that there was no agency in the state capable of handling the situation, either because there was no organized forestry department or, if a department existed, it was weak and ineffective because of the lack of financial support, and there appeared to be little, if any, prospect of acquiring these forest lands on its own account. Here was the federal government ready to extend its beneficent influences by taking over and managing these lands for the benefit of the state and nation. It was anxious to help out the state by doing for it what the state itself was unable to do.

The federal government, of course, would pay no taxes, but this loss of revenue would be amply repaid by giving to the state, for the benefit of the local communities from which the land was

alienated, 25 per cent of the gross revenue which was derived therefrom. In most cases the state representatives, no doubt, thought that the flow of revenue would begin as soon as the government began managing the lands. This has been a disappointment to many communities, as might be expected, and caused considerable local disapproval. The gross revenue from all of the forest lands purchased in the East was, for the fiscal year 1927 (the last of record), less than 4 cents per acre, which, on the 25 per cent basis, returned to the state for local purposes less than 1 cent per acre. It is fair to assume on a conservative estimate that this was less than one-third of what the states would have derived in taxes from these lands if they had continued under private ownership.

It is very natural that the Forest Service should earnestly and honestly endeavor to extend the dominion of its influences by setting up new national forests in as many states as possible. Why not? The more states included, the greater the influence exercised over members of Congress in supporting national forests policies, and it seems much easier to secure money from Congress than from the state legislatures for the purchase of forest land. On the other hand, the states are becoming more and more sensitive to their responsibility and zealous of their rights. The agency that owns forest lands will naturally dominate forest policies.

The national forest idea started with lands already owned by the government. It was a wise policy to set aside lands in the public domain better suited for timber growing and watershed protection than for any other purpose, and to erect them into national forests for efficient

protection and administration. It is a very different matter to take from the federal treasury money to purchase lands in the more highly developed sections in the East and thereby set up jurisdictions that are likely to cause friction and annoyance and interfere with the state's carrying forward a strong forest policy of its own. The federal government cannot hope to acquire sufficient areas in any state to solve its forest problem, even where that state has failed to meet its forest obligations. The most radical proponents of federal control do not claim this.

The control of forest lands is a state and not a national responsibility. This was very clearly brought out following the Capper report of 1920 on the timber situation in the United States. The Capper Bill, calling for sweeping federal control of timber production, was introduced in Congress, followed by the Snell Bill which was based on the idea of co-operation with the states instead of absolute federal control, and embodying in a large measure the views of the Forest Service. The foresters, forest owners, and forest users of the country were keyed up to a high pitch. A referendum vote was taken by the Society of American Foresters as between federal control and coöperative control with the states. While the proponents of co-operation had a large majority, considering the reservations made by many of the voters, the result was inconclusive.

Public hearings were held and after various and sundry public and civic organizations and individuals of varying interests had been heard, both the Capper and Snell Bills were scrapped. The result was the modification of the Capper Bill and the introduction of the Clarke-

McNary Bill to supplant the Snell Bill. The Clarke-McNary Bill stressed co-operation and provided for government regulation only through the states. Public sentiment at this stage had reached a point where any idea of federal regulation was distasteful and the Clarke-McNary law failed in passage until every feature of federal control had been eliminated. It was a sweeping endorsement of state control as against federal control, and set up a precedent which we will do well to ponder carefully. The relation between federal and state responsibility was so well expressed by Colonel Greeley at the hearing on the Snell Bill in January, 1921, that I am going to quote from his statement:

"Regulation of the manner in which forest lands are cut cannot be separated from the regulation of how forest lands shall be taxed nor from regulation of how forest lands shall be protected from fire. All three of these go together in actually bringing reforestation about. It is inconceivable that the federal government would take over the police powers of the states whose exercise is essential to the prevention of forest fires. It is inconceivable that the federal government will take over the taxing powers and functions of the states. But unless these two things are done it is not possible in my judgment for the federal government to regulate how forest lands shall be cut. To split up the one task between different public agencies would lead to duplication of responsibility and confusion. Either the federal government or the state must deal with the private timber owner in all the phases of timber production on his land.

"The degree of regulation that is equitable in consideration of the local

fire hazard, the local tax conditions, and local economic conditions must be worked out by some public agency which controls all of these factors as far as they are within public control. Since it is not possible for the federal government to take over the whole job, the federal government should leave the states to deal with the private forest owner.

"There is no question that our several states have ample police power to regulate the use and protection of forest land. In many instances that power has already been exercised by the states. Twenty-six of our states have established forestry departments and built up organizations for fire protection and other forest work. If the federal government should now attempt to regulate forest lands an inevitable conflict between state and federal requirements would ensue. We would face the prospect of two sets of regulations enforced by two sets of officials upon the same forest owners and not necessarily in agreement. I do not believe that this is the practical way to get results. I do not believe that the effective work done by many states in forestry and the forest organizations which they have built up should be discarded in our federal policy. Rather would I recognize the right of the state to control the use of its own private lands, and build upon that right with the local sentiment and initiative which lie behind it in developing our national forestry policy."

It must be remembered that Colonel Greeley was representing the federal government and willing to go as far in federal control as the public would stand for. While this statement referred to regulation on private land, it has a direct bearing on this question of responsibility

for forestry practice and policy within a state.

It is an admission on the part of the state of its inability to discharge its own responsibilities in handling its forest lands for the benefit of its own people when it asks the federal government to come in and take over the ownership and administration of the lands, not alone for the special benefit of the people of the state in which the lands lie but for the benefit of other states.

It is not fair that a state which in its weakness and perhaps lack of vision allowed the federal government to entrench itself as a forest owner should later, having become sufficiently wealthy and having developed a forestry department able to handle its forestry matters, be excluded from doing so because, years ago, some short-sighted official permitted the federal government to alienate its forest lands.

If the reason for federal acquisition of its lands was to help the state solve its forestry problems, as is so often stated, then provision should be made whereby a state, which has arrived at a point where it is able to satisfactorily administer its own forest lands, be empowered to repossess these lands at net cost to the federal government. This would not divert the land from public ownership but would simply carry out in good faith the purpose of helping a state protect its forest resources and turn them back to the state when the state itself had developed its organization and demonstrated its ability to care for the public interests and to provide the government against financial loss. It is like holding an estate in trust for a minor heir until he shall arrive at the age of discretion. He is the rightful owner but cannot exercise his

ownership until the conditions of the trust have been fulfilled.

In looking over the records of forest acquisition, both state and federal, since the passage of the Weeks Law, certain results stand out very clearly. It shows that federal acquisition is inimical to state acquisition, and that a coördinated program is impractical from the very nature of things. The acquisition program will either be national forests to the practical exclusion of state forests, or state forests to the exclusion of national forests, and in practice this is substantially the result today. Run through the list of states in the East that have any considerable areas of state forests, and you will note the absence of national forests. On the other hand, in states where national forests have been set up you will find that state forest acquisition has made little, or no, progress. The only notable exception is Pennsylvania, having large areas of state forests and recently having opened the state to federal entrance for national forests. It is to be noted that a very clearly defined sphere of influence has been agreed upon, and a relatively small area in the northwestern corner of the state staked off for national forest administration. The experiment is of too recent

date to offer definite conclusions. If both national and state forests are to exist in any state without friction, this idea of limiting the sphere of activity and influence is apparently the only practical plan, but I do not believe that such a plan will serve the best interests of the people.

Every state organized for forestry work has certain definite responsibilities that are state-wide in character. It is much more economical for the state to administer all the forest activities within its borders with its own administrative force than to have these shared by the federal government. Where national forests have been set up in a state, there are in effect two separate sovereignties, with more or less duplication of effort and conflict of interests. The two organizations do not function in the same way and cannot be fully coördinated.

Federal acquisition has been a distinct loss to the states in taking away responsibilities that were rightfully theirs to discharge, making it easier to pass up a duty that should be fulfilled, resulting in a loss of initiative and independence that can never be recovered. The federal government can never solve the problem by itself, and if state initiative is lost, forestry in the long run must suffer.

DENUDED VERSUS RESTOCKED LANDS FOR ACQUISITION¹

By PHILIP W. AYRES

Forester, Society for Protection of New Hampshire Forests

IN STATES where the cost of forest land per acre is limited to \$10 or less by legislative enactment, as in Ohio, Pennsylvania, and Connecticut, there are, of course, few if any examples to illustrate the desirability of acquiring restocked rather than denuded areas. By shrewd management even in these states there are returns from the sale of forest products. Thus in Connecticut, which has now 39,000 acres of state forests, there are revenues of \$2500 a year. Mr. Hawes, State Forester, has well pointed out that the state forests are a business enterprise, which he says are "much in the same condition as a manufacturing concern with insufficient capital." Mr. Elmer Fletcher, who is familiar with the situation in Connecticut, sees there a distinct tendency away from the acquisition of cut-over land as such, and an effort to secure as much restocked land for the money as the legislative restriction will permit. Doubtless this is true in the other states also.

But the situation is not dissimilar in a number of states where the price per acre is not limited by statute. Thus Vermont, which has a total area of 34,000 acres in state forests, has never paid higher than \$12 an acre. Here Mr. Ross, the State Forester, is conducting some highly interesting experiments and keep-

ing some highly interesting records in the management of his forests. Thus upon the L. R. Jones State Forest at Plainfield, 640 acres were acquired about 20 years ago at \$4.50 per acre. Some good timber came in the bargain. Mr. Ross indicates that the total expenses on account of this forest, including purchase \$2880, taxes \$1625, planting \$2649, lumbering \$1483, surveying, and other charges, will amount to a total on July 1, 1929, of \$9400, and that the total income from the forest at that time will be \$8600, leaving only \$800 for net state expenditure. Doubtless in time the \$800 will be wiped out, and the state will have a productive forest that has paid all costs of every kind. The timber that makes this result possible did not, of course, grow during the period since the forest was acquired. It was there with the original purchase, which was a very favorable one. Vermont has a somewhat similar showing in the George Aiken Forest of 800 acres near Rutland acquired in 1912. The average cost per acre was only \$2.35. The total expenses charged against this forest to July 1, 1928, including the purchase price and taxes, amounted to \$8103; whereas its receipts to the same date were \$4834, or exactly 60 per cent of the total cost to the state.

We have been less fortunate in New Hampshire. During 12 years the state has had \$5000 a year for the acquisition

¹ Presented at the annual meeting of the Society of American Foresters, New York, December 29, 1928.

of forests, a total of \$60,000. This has been well invested, largely in promising young woodlots, chiefly for demonstration purposes, that have not yielded a large return, but for the most part they were not denuded lands. It is estimated that these lands are now worth at least \$10 per acre, or a total of \$200,000 for which the state paid out only \$60,000. This is an excellent argument before the appropriation committees of the legislature. The investments have been well made even if the returns as yet have not been large.

The town forests in New Hampshire afford interesting illustrations. Thus in 1919 a forest of 800 acres was donated to the town of Warner. From it several thousand dollars' worth of thinnings have been sold, by means of which a local charcoal and wood alcohol plant that had been abandoned was revived. The town of Danville has a net bank balance of \$10,000 from its town forest, which has been a valuable possession during many years. Regularly it has paid the minister from town forest income.

In Massachusetts the chief objective has been to acquire and reforest idle land. On 100,000 acres acquired at approximately \$5 an acre, which includes the cost of survey and title service, it has not been possible and is not expected that returns will accrue for many years to come. The mounting costs of interest on original purchases, and upon the cost of reforestation carried forward at compound interest for long periods of time, are so great that some of the shrewdest members of the Massachusetts Legislature have used their influence solidly against further appropriations to be used in this manner. And yet, in some of its purchases of forested land, Massachusetts

is able to make the beginnings of a good showing. Thus, on 11,000 acres on October Mountain in the western part of the state acquired seven years ago at \$5 per acre, total \$55,000, already about \$10,000 has been received from the sale of forest products, a return of about 20 per cent on the original investment.

In New York State the situation, of course, is entirely different because no sales are permitted, but the figures for acquisition are significant. Thus in using the \$7,500,000 provided by a bond issue in 1916, 254,000 acres have been acquired at an average price of \$22.24 per acre. Included in these purchases are 30,000 acres in Essex County in the Adirondacks that have been acquired at a price of \$72.54 per acre. Mr. Howard reports that some of these acres carry heavy stands of merchantable timber, largely softwoods, ranging from 20 cords to as high as 60 cords per acre. At least state acquisition of timbered areas is not without precedent.

In the Lake States, Mr. Zon reports that the price paid has seldom, if ever, reached \$5 per acre. There appear to be no returns. The gravity of the problem is apparent in that Mr. Zon estimates the annual freight bill on imported lumber in the three state of Michigan, Wisconsin, and Minnesota at \$31,000,000.

Doubtless many of you are familiar with an article by Mr. P. S. Lovejoy in the *JOURNAL OF FORESTRY* for April, 1926, entitled "The Worst-First Theory." He pays his compliments to the practice of buying cut-over and idle land in the following selected sentences:

" . . . ragged patches of bankrupt lands reluctantly accepted and dedicated by the state authorities . . . so poor

that they were not worth stealing while the stealing was good."

He advocates:

"1. Adequate programs must involve early and very great development of public forests, and

"2. Public forests, to be most effective, must be so located and so managed as to insure the most certain, earliest and most generous returns.

"If that logic is sound, then the foundations disappear from under the old worst-first policy and to continue it in effect will be professional and economic malpractice.

"The fundamental rule of land economics is that when new development is

Mr. Lovejoy then deprecates the "vague optimism" that characterizes much of our forest practice.

So much for the states.

The situation on the National Forests that have been acquired under the Weeks Law affords several very interesting illustrations. I am under obligation to Major Evan W. Kelley, District Forester of District 7, which comprises all national forests east of the Great Plains, for a valuable letter, accompanied by the following table, in which he shows the operating expenses per dollar of receipts upon each forest in that district except the Lake States during the years 1926, 1927, and 1928:

OPERATING EXPENSES PER DOLLAR OF RECEIPTS

Forest	Fiscal year		
	1926	1927	1928
Alabama	\$2.152	\$6.086	\$13.546
Allegheny	9.075	15.885	2.257
Cherokee	12.444	19.437	10.860
Choctawhatchee-Ocala ² .....	.975	1.919	41.000
Monongahela	3.980	6.955	12.890
Nantahala	1.923	1.894	1.990
Natural Bridge .....	.900	1.842	1.681
Ouachita ² .....	.724	.774	3.360
Ozark ²	8.730	25.282	38.330
Pisgah	3.804	4.799	4.051
Shenandoah	2.817	3.106	1.209
Unaka	1.545	1.731	2.095
White Mountain .....	.981	1.378	1.851

² These include both reserved public domain lands and purchased lands.

to be justified at all, such development should be directed toward or into the best available soils, sites, and locations.

". . . . to permit the steady wrecking and devastation of good, thrifty, self-renewing forests, while at the same time laboriously building up new forests on cull lands, surely partakes of economic idiocy rather than of expediency.

". . . . good forestry cannot be built upon unsound economics."

Omitting the forests which were set apart from the public domain, and therefore not wholly purchased, it appears that in 1926 only two of the forests acquired under the Weeks Law had reached the condition of self-support. These were the Natural Bridge Forest and the White Mountain Forest. In 1927 and in 1928 none of the purchased forests in District 7 were self-supporting, due, as Major Kelley points out, to two rea-

sons—first, a depression in the hardwood market which made it impossible to get rid of a considerable quantity of overgrowth hardwoods; and second, a considerable increase in the cost of administration. Let me quote from his letter:

"It will be observed that during the fiscal year 1926, four of the National Forests of District Seven were self-supporting, namely the Choctawhatchee-Ocala, the Natural Bridge, the Ouachita and the White Mountain. During the fiscal year 1927 the number dropped to one—the Ouachita. In the fiscal year 1928 they were all in the "red." Why the change in the situation? First, I should say because of the general depressed situation in which the hardwood lumber industry has been during the past two years. Absence of demand for hardwood curtails our timber sale business as a natural consequence. Then too, we have established higher standards in fire control on most of our National Forests. Higher standards involve the expenditure of greater sums for fire prevention, preparedness and suppression.

"Off-hand, it seems to me that the public cannot expect the eastern group of National Forests to be self-supporting inasmuch as purchases to date have been very largely confined to cut over lands, burned over lands and culled lands. In the by and large, the Ouachita, Ozark, Ocala, and Choctawhatchee excepted, we are dealing with the leavings of the lumber industry and on some of our areas little or nothing was left. Bearing this in mind, since the sale of timber is depended upon for most of the revenue of the National Forests of this District, receipts can hardly be expected to cover the cost of the restoration of timber crops.

"It should also be kept in mind that much money is spent for forms of public service which return no direct revenue to the United States Treasury. For instance, we have the obligation of protecting the upper slopes and ridge top sites which grow little or no timber of commercial value, but which, nevertheless, are important parts of the watersheds in in which they are located. Roughly, I should say about 15 per cent to 20 per cent of the total area of the Eastern National Forests consists of land of that general character. Then too, we have the expenses incident to the administration of wild life and non-revenue recreation, the return for which comes to the general public in forms other than in dollars turned over to the credit of the Treasury account."

Let me quote also two sentences from an interesting letter written by Mr. J. J. Fritz, now Director of the Battell Forest owned by Middlebury College in Vermont and formerly Supervisor of the White Mountain Forest:

"Within individual purchase areas that have been established, it seems to me that it would be a very short-sighted policy of the government to let well-timbered lands become denuded before purchase just in order to spread the money available over increased area. If you will hold to the strictest terms of the Weeks Law, it seems to me that the commission held responsible for purchase is obligated to buy lands which are already of value for watershed-protection purpose as well as lands which have become denuded for the purpose of restoring them."

Let me now mention two important general considerations that need to be

kept in view in the acquisition of any forest land, but particularly of restocked land:

1. Much depends upon the certainty of a market for the product. When restocked lands are without a prospective market for long periods, either from their inaccessibility or for other reasons, the forest is likely to deteriorate at a loss to the investment.

2. Denuded land must be carried for a great many years before yielding a profit. The interest and carrying charges for fire protection, reforestation, and other costs mount tremendously. In Government purchases these carrying charges are widely distributed among the people, so that the burden is less apparent, but they have to be carried just the same. Land on poor sites may never catch up with the cost.

These principles find illustrations in the White Mountain Forest. Let me give two:

1. In Bean's Purchase, known as the Wild River Valley, a large tract of about 25,000 acres was acquired 15 years ago, soon after the Weeks Law came into operation. It came fortunately at a low price, so that the carrying charges have not been heavy. This had been lumbered for softwoods in the manner formerly profitable, with the result that certain scattered stands of spruce and fir of some value now remain; there are several areas badly burned, before the land was taken by the Government; but the chief stand is an extensive area of hardwoods, including not only the original beech, birch, and maple, but also large areas of younger birch in good condition. The most skillful efforts of the Supervisors of the Forest have failed so far to secure a market for this timber. The result here, as in

some other parts of the White Mountain Forest without a market, is that the silvical care which characterizes large parts of the Forest is lacking. Where the old growth hardwoods can be removed, excellent young growth follows. This is not the case so far in Wild River Valley.

2. A second illustration is the Waterville Purchase, which seems to afford the star argument for acquiring areas that carry valuable timber. The tract consists of 22,500 acres located in the heart of the White Mountain Forest. Already the Government had acquired land and timber on two sides of this tract. The entire area is within purchase boundaries. On this tract no forest fire of any account has ever occurred. Logging operations have taken place upon it during the past 30 years. On nearly all of this logged area a fine second growth of spruce and fir has occurred, much of which already has commercial value. A careful cruise of the tract by the Forest Service disclosed 6000 acres of virgin merchantable spruce, much of it of fine quality.

About two years ago the Parker-Young Company acquired the tract at a cost slightly in excess of one million dollars. This company proposed to extend a logging railway through a mountain path, and to cut over the entire tract. This logging railroad would bring a train of fire into the heart of the White Mountain Forest threatening not only Waterville Valley, but also the adjacent areas already acquired by the Government. Fire protection was, therefore, one factor in determining the purchase. A scenic feature also was present, but in a secondary way.

The National Forest Reservation Commission caused a careful survey to

be made of the entire area. The vision and I believe the wisdom of Colonel Greeley, then chief of the Forest Service, did the rest. The company agreed to sell at cost, and during a period of 15 years to cut the 6000 acres of spruce timber and some of the mature hardwoods at a price which, at the close of this period, will largely reimburse the Government for the original cost. The contracts have been signed on this basis. The 13,000 acres of cut-over land will not be touched at all; no logging railway will be constructed; the scenic features and roads and trails will be protected; and at the end of the period, barring fire, the Government will have a large and splendid young forest practically free of cost. The real cost to the Government is the interest on the original investment, which interest, of course, diminishes from year to year. In time this also will be wiped out as a cost to the Government from further sales of timber on this property.

Now to the main question: When and to what extent is it justifiable to expend public money for forest land bearing merchantable timber versus denuded land? The certainty of adequate market appears to be one of the leading factors in the solution of this question. We may also question the advantage in buying timbered areas and holding them for a

period of time, unless they can be acquired at a low purchase price. We should not lose sight of the fact that an investment made by a state or by the federal government continues to carry charges even though the actual interest and taxes are not paid. To buy denuded land or to buy forested lands carrying mature timber, and to hold these for long periods of time, may be really taxing future generations without representation. To acquire and hold growing timber is another matter.

Facing these facts squarely the question is before us: When is the Government justified? When is there a possibility or likelihood of adequate return upon the investment, whether one buys denuded or restocked land? In the face of substitutes and inventions, is the acquisition of any land by the Government on poor sites justifiable, whether denuded or restocked? Can the Government afford to take such lands even at a dollar an acre? We must not, of course, omit the important consideration of protecting the flow of waters at the headwaters of our streams, whether the land carries timber or not, nor the other important consideration of closing in contiguous areas for fire protection and other reasons.

DENUDED VERSUS RESTOCKED LANDS FOR ACQUISITION¹

By E. A. SHERMAN

Associate Forester, U. S. Forest Service



THE TOPIC "Denuded Versus Restocked Lands for Acquisition" covers a field prolific of questions both of forest finance and of present and prospective public needs. If we consider the subject as one which involves only the simple question, "In acquiring forest land to which class should preference be given, denuded lands or restocked lands?" we have a problem which does not admit of a categorical answer. Its consideration promptly conjures up a crowd of contingent questions, such as, Acquisition for what? Timber? Watershed regulation? Scenery? Recreation? Again, each one of these sub-questions raises a brood of sub-questions of its own: Acquisition? Acquisition to increase timber production? Or, what is much the same thing, to decrease timber destruction? If to increase production, then with what ultimate design? To increase the supply which we will have 20 to 30 years from now, while private owners are still in the keenest competition for the privilege of liquidation? Or to increase the supply, say 60 years from now, when liquidation will be so far advanced that it is accompanied by a run-away market on account of low visible supplies? If it is said that the purpose of acquisition in a given case is to decrease

destruction, then the question arises, What is the objective of such decrease? Is it to save the scenery, to protect the watershed, or to augment future wood supplies?

Whatever the answer may be, still other questions are likely to arise. If, for example, the objective is streamflow regulation, there arises another group of sub-questions. Regulate how? As to purity? As to regularity of flow? Also, regulate for what? For navigation? For irrigation? For recreation? For power, or for domestic consumption? Even after these sub-questions are answered the problem has still other ramifications. Obviously forest lands on the watershed of the stream which we wish to influence should have preference in acquisition over forest lands not on its watershed, whether denuded lands or restocked lands. Again, in acquisition for watershed protection denuded steep lands subject to erosion naturally take precedence over restocked level lands not subject to erosion. Steep denuded lands and steep restocked lands on the same watershed present still another set of special conditions.

Immediately the question arises, "How will transfer of title change the situation?" Usually the very fact that lands are in the denuded class is evidence of neglect on the part of their owner. Upon the other hand, the very fact of being restocked indicates interest upon

¹ Presented at the annual meeting of the Society of American Foresters, New York, December 29, 1928.

the part of the owner and recognition of existing values worth protecting, or (more likely) low fire hazard and good luck. Under such conditions state or federal acquisition of denuded lands for forest purposes usually results in bringing such lands immediately under a reasonably effective system of fire control, to that extent reducing the menace which their presence causes to adjoining restocked lands, while permitting the process of natural regeneration to assert its healing force so far as regenerative possibilities are still left upon the land or adjoining it. Under such a process the public steps in and assumes the burden and responsibilities of ownership, where such burdens and responsibilities have been abandoned. The owners who are still carrying on are permitted to do so, but even in their case the burden is lightened by removing the element of extreme hazard represented by abandoned or neglected lands. Had the priorities been reversed we would then have a case of the government deliberately substituting public protection for private protection, while at the same time leaving unprotected lands still unprotected.

But even this situation requires careful scrutiny. It sometimes happens that restocking is the result of good fortune rather than forethought. The owner may have been more lucky than provident. Acquisition by a responsible agency and dependence upon good management rather than good luck may save restocked lands from passing into the denuded class. Furthermore, price considerations may have a great deal to do with determining priorities. The owner of denuded land sometimes has exaggerated ideas of the price possible to obtain for his property, and sometimes the owner of restocked

lands fails to appreciate the value of what he has to sell. This not infrequently results in the same price being asked for both classes alike, in which event the decision is obviously in favor of the restocked areas. While the broad problem admits of limitless refinements, carrying us into widely separated and tenuous fields of theoretical speculation, after all most of these speculative refinements are of little more than academic interest.

Probably the best proof of such a conclusion is furnished by the results of the purchase work of the National Forest Reservation Commission. This Commission, with the Forest Service as its agent, is one of the most active timberland purchasing concerns in the world today. Probably no other responsible purchaser has in recent times been a more liberal buyer of denuded lands. Doubtless some of you will recall that it has been intimated that in its purchase work the federal government is following a "worst-first" policy. However, a careful estimate of all the forest lands approved for purchase by the Commission shows that only about three per cent will require artificial restocking, as against 97 per cent naturally restocked. The "worst-first," therefore, takes place in the catalogue of things "unimportant, if true."

The trend of acquisition as a federal activity is usually not greatly influenced by considerations of denuded versus restocked lands. The location and boundaries of each purchase unit are generally determined by broad topographic features or by some special economic or jurisdictional conditions. For example, the location of the White Mountains largely governed the establishment of our purchase unit in New Hampshire, while the location of a considerable acreage of land

in government ownership on the watershed of the Au Sable River determined the location of the Huron National Forest in Michigan. I know of no instance where the primary governing consideration has been controlled by the relative percentage of denuded versus restocked lands. Other considerations have been of controlling importance. In purchasing with a view to the management of large units, as the federal government necessarily does, once the location and general boundaries are established, the objective is to purchase all lands within such boundaries which are chiefly valuable for forest purposes and obtainable at reasonable prices. If federal acquisition within a given region were predicated upon the desirability of demonstrating the maximum profit per acre per annum obtainable by practicing forestry on a given area, unquestionably the best financial showing could be made by buying as cheaply as possible lands most nearly approaching restocking by well advanced growth of the most valuable species.

But public acquisition is never undertaken or advocated for such a purpose. Anybody could make a financial success practicing forestry on such lands. Demonstration of the obvious is unnecessary. Public acquisition usually has some other objective than the mere purchase of real estate at a bargain. Public acquisition is, however, necessarily guided with an eye which is not blind to the "main chance," particularly when it assists in advancing the primary objectives for which the purchase of forest lands was authorized.

While, as I have said, the acquisition of purchase units for practical forestry purposes involves consolidation of all forest lands within the unit area whether stocked or denuded, at the same time fire

control within the area is usually the most urgently critical need. This fact usually results in precedence being given to such purchases as will go farthest in removing the fire hazard, or, stated in other terms, which will be most effective in piecing out the blanket of fire control for the area as a whole, regardless of ownership. This usually means the immediate purchase of denuded lands, the derelicts of irresponsible operators. In the course of years thereafter as funds for acquisition are made available by Congress, and as owners are willing to sell at reasonable prices, public ownership is steadily blocked together, the blanket of acquisition activities eventually covering all classes of land within the purchase unit, denuded or restocked, which are chiefly valuable for timber production and purchasable at a reasonable price.

As I have said, usually consideration of denuded versus restocked areas is a minor phase and only of academic interest as compared with numerous other major considerations which control and direct acquisition. At the same time it seems desirable and in the interest of clear thinking to declare that if a case should arise where a choice must be made between two areas otherwise equally suitable, necessary, and desirable, but one largely denuded and the other largely restocked, it is my belief that it would be sound public policy to give preference to the denuded area, and doubtless the National Forest Reservation Commission would so act should such a case ever be presented to it for decision. The final broad aspects of the problem might be summed up this way:

We have in the United States a certain acreage of land reasonably well stocked with timber that is or soon will

be ripe for the saw; a certain acreage reasonably well stocked with younger age classes of timber; and a certain acreage only lightly stocked with or entirely devoid of timber. Sound national economy dictates that all three of these classes of land shall be used to grow timber continuously, not only to meet current needs but to also meet the needs that inevitably will exist in, let us say, the year 1978. How shall this obligation be met?

So far as the fully stocked stands of mature or almost mature timber are concerned, it can in large part be met by private initiative. Basic conditions are such as to create the probability that on such lands private forestry will be reasonably safe and profitable. So far as the fully stocked stands of immature timber are concerned there is still the probability that private forestry will in large part be


practicable and profitable. But so far as the depleted or denuded lands are concerned, the probability of successful private forestry is so remote that it can in most cases be dismissed as a possibility.

If that is so, what is the answer: abandonment of such lands to progressive deterioration and destruction through lack of care, or acceptance of their redemption as a public responsibility to be shared by the states and the nation? And if it is agreed that a national monopoly of all timber productive lands is socially and economically unwise; that the forests owned and controlled by the nation should be limited or restricted in area; then what part, bearing in mind the timber needs of the future, should be taken over by the Government, and what part left to private initiative? The question answers itself.

WHAT ABOUT WATERVILLE?

By R. M. EVANS

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HE WATERVILLE TRACT in the White Mountain National Forest, N. H., will occupy a prominent place in the history of acquisition in District 7, both because of the size of the transaction and because of the negotiations leading up to the purchase. This tract of 23,123 acres, including within its boundaries the famous Greeley Ponds in Mad River Notch and some of the finest virgin spruce and northern hardwoods left in the region, bulks large in the minds of conservationists and recreationists of the Northeast; it is important to the Government, too, because of its high forest value and because it plugs a big hole in the White Mountain Forest.

The first unsuccessful attempts to purchase the tract from the International Paper Company were made 12 or 15 years ago. In 1926, the Woodstock Lumber Company stepped in and bought it for \$1,000,000—and immediately there was an uproar, for this company threatened to build a logging railroad through the notch and by the ponds, inevitably destroying for all time the beauty of this spot so widely known and so greatly cherished by the thousands of visitors to the White Mountains. How the full weight of public opinion was brought to bear on the company and on the Forest Service; how delegations representing forestry and recreational

organizations, professional men of all kinds, and big and little business from the entire United States and some of its possessions urged upon the National Forest Reservation Commission, the Budget Bureau, and the President, the necessity of acquiring this tract; how the Forester and other government officials, even the President, were deluged with letters pleading for favorable action; and how Colonel Greeley finally put it over through the generous expenditure of his own time and energy, even though a supplemental appropriation of some \$800,000 had to be secured by a definite date—all these would make an interesting story.

The International Paper Company began logging operations on this tract in 1889. Up to 1928, when title passed to the government, some 200,000 cords of spruce and fir pulpwood and 20 to 25 million feet of hemlock, white pine, and hardwood sawtimber had been removed. There remains an estimated stand of 206,000 cords of pulpwood and 31 million feet of hardwood sawtimber. But of this remaining stand, 22,000 cords of pulpwood and one million feet of sawtimber are included in scenic areas upon which no cutting will be allowed. The net price paid the Woodstock Lumber Company was \$997,979.00 which, in addition to the main tract, includes a dam, storage pond, and cutting up plant for

pulpwood at Campton, stream improvements on Mad River, and other odds and ends. As a further consideration, the Secretary of Agriculture agreed that the timber on the unreserved portions of the tract should be offered for sale during a period of 15 years in accordance with usual Forest Service practice.

In approving this purchase, the commission was influenced in no small degree by the financial aspects of the transaction. Fortunately, the ardent proponents of government ownership saw the reasonableness of cutting the merchantable timber, except on the scenic areas, so long as Forest Service methods and restrictions were enforced. (It seems to have been the impression that the Forest Service would wave some magic wand and all difficulties—physical, financial, and silvicultural—would fade away. Let's hope there will be no disappointments!) The matter was clinched by a balance sheet which handled probable income, interest, and carrying charges so masterfully as to disarm the most pessimistic of the commission members. We have fulfilled our obligation to sell the timber and it is now timely to see how our representations to the commission are likely to pan out.

The contract with the Waterville Timber Company runs for 15 years with reappraisals at three-year intervals. Initial prices are \$4.50 per cord for pulpwood and \$5.50 per thousand board feet for hardwood sawtimber, increases of 61 cents and about \$1.75, respectively, over the figures used in computing the purchase price. Logging will be on snow only. Pulpwood will be driven down

Mad River and sawlogs will be hauled to Campton by Lombard tractors. In addition to the stumpage price of pulpwood, the company will deposit 60 cents per cord in the Cooperative Fund to cover the cost of softwood brush disposal, cutting wolf trees, and performing other cultural operations, all of which will be taken over by the Forest Service. Since this deposit results in benefits which accrue to the government, the return from pulpwood might properly be considered to be \$5.10, or \$1.21 per cord over the purchase price.

Now let's see where we stand:

Net price paid for tract....	\$997,979
Total receipts at end of 15	
years	997,500
Deficit	\$ 479

To offset this apparent deficit, we shall have the land, the young growth on areas cut over prior to purchase, the Campton property, and the timber on the scenic areas—a total value of upwards of \$300,000, not to mention possible increases in stumpage prices during the 15-year life of the contract and probable overcuts.

But this is too simple for the hard-headed ones who will grab their pencils and start figuring interest and carrying charges. Perhaps we can satisfy them. Income and outlay may be compared by compounding both to 1943, when the tract will be cut out, or by discounting the expected returns to June 1, 1928, the date of purchase. Using the latter method and 4 per cent, a fair interest

rate for the government, we have the following:

Purchase price, June 1, 1928.	\$997,979
Net receipts from sale of timber for 15 years dis- counted to June 1, 1928, at 4 per cent.....	672,663
	<hr/>
	\$325,316

Value of land, young growth, Campton property, and timber on scenic areas, all of which were withheld from sale by the govern- ment	320,767
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Deficit	\$ 4,549
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This small apparent loss makes less than one-quarter of one per cent difference in the interest rate.

The receipts represent the sum of the discounted net annual receipts for each of the 15 years until 1943, after the annual costs of sale administration and extra fire protection have been deducted. For example, the average annual receipts are estimated at \$66,500. The estimated annual costs of sale administration and protection are \$6000, so the net annual receipts are \$60,500.

If no allowance is made for interest, the apparent loss of \$4549 changes to an apparent profit of \$230,288. In this computation no account is taken of possible increases in stumpage prices during

the life of the sale and of probable overcuts above the estimate, which will likely more than wipe out the small deficit. Upon the other hand, no account is taken of the possibility of losses from fire or other disaster. Of course, a much better showing could have been made by including the coöperative deposit in the stumpage price.

But some skeptical individual will probably say that no allowance is made for the 25 per cent and 10 per cent funds. True enough, and quite properly. These funds do not remain in the U. S. Treasury, it is true, but are appropriated by Congress for the *public* benefit. The 25 per cent fund is intended to compensate local governmental units for taxable property removed from the rolls. It must, of course, be recognized that \$249,375, or 25 per cent of the total gross receipts from the sale, do not remain in the Federal Treasury as an offset to the purchase price, but go instead to the local public treasury. This amount will materially relieve the tax problem in many other towns as well as Waterville and is a desirable feature of the sale from every angle excepting that of a U. S. Treasury balance.

So it would appear that the government hasn't done so badly. Besides, we have acquired a wonderfully productive property, and have preserved areas of great scenic and recreational value for the use and enjoyment of many thousands of people.

BOND ISSUES FOR STATE FORESTS¹

By ARTHUR S. HOPKINS

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THE main sources from which funds for the acquisition of public land may be secured are as follows: Appropriations by the legislature; gifts of lands or money; receipts from the sale of escheated lands and other lands which are owned by the state but which are not dedicated to some specific use; and bond issues. Whether or not any one of the first three classifications will provide an adequate sum of money depends upon many factors, such as the size of the state, the cost and character of the lands to be acquired, and the comprehensiveness of the purchase program. All of them have certain undesirable features. Legislative policy is apt to change and annual appropriations fluctuate or fail at critical times. Gifts of land and money are, of course, dependent upon the generosity and number of givers in any one community and are often made subject to conditions which are not for the best interests of the state. Receipts from the sale of various so-called unappropriated state lands are usually small in amount and of a very intermittent character.

A bond issue for this purpose, backed by a definite purchase program, provides many features lacking in the others. Perhaps the most important of these is to insure in advance a continuous program of acquisition over a definite num-

ber of years. Such continuity makes it possible to build up a competent and efficient force of surveyors, appraisers, title examiners, etc., which is absolutely essential for carrying out a program of large size. A purchase program spread over a term of years permits the agency acquiring the lands to play a waiting game and thus oftentimes to acquire lands at a lower price than otherwise, and also makes quick action possible in cases of emergency.

Because of the fact that New York State has the largest forest land property of any state and was the pioneer in state land acquisition, it would seem that a brief statement of its methods and experience in the purchase of land might contribute more than anything else to the general subject under discussion, especially as it will show in a concrete manner just what has been accomplished over a period of more than 50 years.

The land acquisition policy in New York had its inception in 1872 when a State Park Commission was created by an act of legislature. It is interesting to note that the following year this body reported that a large portion of the Adirondack forest should at once be protected from destruction, and pointed out the necessity of watershed protection, the effect of forest on climate, and the desirability of establishing a reserve supply of timber. However, it was not until 1890 that the first appropriation of \$25,000 for land acquisition was made

¹ Presented at the annual meeting of the Society of American Foresters, New York, December, 29, 1928.

available by the legislature, and a forest commission established and authorized to acquire forest lands. During the intervening period, a substantial acreage, consisting of lands which were withdrawn from public sale and lands which had been abandoned by their former owners for nonpayment of taxes, was segregated to form the nucleus of the Forest Preserve in the Adirondacks and Catskills. In 1873, there were less than 40,000 acres in state ownership in the Adirondacks. This had been increased to about 750,000 by 1883. Between 1890 and 1909 at irregular intervals, the legislature appropriated \$4,075,000, as follows:

1890.....	\$25,000
1895.....	600,000
1897.....	1,000,000
1898.....	500,000
1899.....	350,000
1900.....	250,000
1904.....	250,000
1906.....	400,000
1907.....	500,000
1909.....	200,000

From these appropriations, averaging about \$215,000 per year, there was purchased a total of 748,322.97 acres in the Adirondacks and 51,819.98 acres in the Catskills, aggregating together 800,142.95 acres. The average price for Adirondack and Catskill lands was \$4.80 and \$2.25 per acre respectively, exclusive of any of the expense of acquisition. These purchases, together with the lands acquired through original ownership and tax sales, brought the preserve area in 1913 to approximately 1,643,000 acres. No appropriations for state forest purchases have since been made by the legislature, although in recent years several

small appropriations have been made for the purchase of specific areas of park land.

The period between 1909 and 1916 brought forth many changes in New York State. The building of improved highways and the increasing use of automobiles brought an increasing number of people into the Forest Preserve areas. In addition, many sections which hitherto had been immune from lumbering became valuable for their timber, chiefly on account of the tremendous increase of the paper industry. The heaviest stands of softwood timber available for pulpwood were almost without exception located in the high mountain region of scenic value. The bad forest fires of 1903 and 1908 helped to create the idea that fire followed the axe, and that if the remaining scenery was to be protected much of the mountain area owned by lumber companies should be in state ownership. This state wide feeling culminated in the bond issue of \$10,000,000 approved by popular vote in 1916, providing the largest sum ever set aside by any one state for a similar purpose. Of this amount, \$2,500,000 was voted for the acquisition of additional lands for the Palisades Interstate Park and \$7,500,000 for lands in the Forest Preserve. This money became available in 1917 and was not exhausted until 1927, the yearly expenditures averaging \$750,000.

It was at once apparent that such an amount could not be expended efficiently at a rate faster than approximately \$1,000,000 per annum, and that if these moneys were to be wisely expended, the lands to be acquired must be considered carefully from all angles and examined in the greatest detail, both as to their physical aspects and as to the quality of

their titles. A definite land acquisition policy was formulated which provided for the purchase of scenic and recreational areas threatened with immediate lumbering operations upon which stood a large amount of the remaining virgin softwood growth; of areas for watershed protection on the headwaters of the large rivers and on the watersheds from which various municipalities derived their water supply, notably the Esopus and Schoharie Creek watersheds, supplying the City of Greater New York; of tracts of second growth, chiefly valuable as a future supply of timber; of areas providing accessible hunting and fishing; of public camp site areas and shore lines of lakes for recreational use; and also of small tracts consolidating the state holdings and eliminating boundary lines.

It may be of interest to outline briefly the method by which this project was carried on. With the exception of some few critical areas where lumbering operations were either being conducted or projected for the near future, the state in general played a waiting game and purchased what might be called the fluid land. As soon as the bond issue had been approved, the Conservation Department at once received more offers of land than it could act on during the first two years. A force of foresters and appraisers was employed to examine and appraise the lands under consideration. A force of title examiners was employed in the Land and Title Bureau of the Department of Law. Landowners were required to submit a formal offer in writing, stating briefly the location and character of their land, and also to set a price upon it. These offers were scrutinized carefully in the light of general knowledge of the purchase areas, first as to their location,

second as to their character, and third as to the asking price. If it developed that the lands were unfavorably located, their character not suited for forest preserve purposes, or the asking price out of reason, the owners were informed that the state was not interested in their purchase at that time. When the lands appeared desirable and the price not too high, they were next examined and appraised. In the case of lands having a high value on account of their merchantable timber, careful and detailed valuation surveys were made. The results of these surveys, together with reports of the appraisers as to the stumpage value, gave the basis for negotiations with the owner as to price. In many cases, joint valuation surveys were made with the seller. No valuation surveys were made on small parcels of land of low value per acre, but they were carefully gone over by appraisers and purchased on an acreage basis. Upon agreement with the owner as to price, a contract was entered into by the Conservation Commissioner.

The bond issue referendum provided that all purchases should be subject to the approval of the Board of Commissioners of the Land Office. This Board meets at least once a month, at which times the contracts are presented to it, together with detailed appraisals, maps, and other information relating to the lands under consideration. Following their approval, the matter is referred to the Land and Title Bureau of the Attorney General's office, for an examination of the title. A title search is then secured from a title company and examined by the Title Bureau. If any objections to title are found they are forwarded to the owner. Upon the removal of these objections, the Department of

Law prepares a deed and voucher for execution. After these papers have been signed and the deed placed on record, that Department certifies to the Conservation Department its approval of the title. The vouchers are then incorporated in a schedule and forwarded to the State Comptroller for payment. This procedure may seem to be unduly complicated and slow, but experience has shown that it is necessary in order to safeguard the interests of the State.

During the period from 1917 to 1927, there was approved by the Board of Commissioners of the Land Office a total of 608 different proposals, 195 of which were later rejected by the Department of Law on account of faulty titles or were dropped for other reasons. Of the remaining 413, 341 were contracts and 72 appropriations. The total area acquired in the Adirondacks and Catskills was 293,822.05 acres, for a total consideration of \$6,524,162.60, at an average price of \$22.24 per acre. In addition, the underlying title to 41,440 acres of land claimed adversely to the State was purchased for the sum of \$250,400. The acquisition of this bottom title cured for all time the defects in the state's title to an area estimated to be worth over \$6,000,000. The average price for all lands acquired, including also the expenditures for underlying title and expenses, amounted to approximately \$25 per acre. It should be borne in mind, however, that this included also examination, appraisal, and title searching of the 195 rejected titles mentioned above, as well as the expenses of the comptroller's office in connection with the sale of the bonds. The total expenditures may be summarized in percentages as follows:

	Per cent
Cost of 293,822.05 acres of land.	87.02
Cost of underlying title to 41,440 acres	3.30
Expenses of Department of Law.	5.07
Expenses of Conservation Department	4.34
Expenses of Comptroller's Department, printing of bonds, etc. ....	.27
Total	100.00

Before the 1916 bond issue funds were exhausted, legislation was enacted providing for a consolidated State Park Program and a referendum submitted to the people in 1924 providing for a park bond issue of \$15,000,000, of which \$5,000,000 was segregated in the referendum for the purchase of additional lands in the Forest Preserve. The remaining \$10,000,000 was provided for acquisition of land and for permanent improvements within the various park regions set up by the unified state park law. The referendum provided for 50-year bonds for the moneys used for the purchase of land, and 25-year bonds for those issued for permanent improvements. There was no money allocated to the Conservation Department for permanent improvements upon the forest preserve area, because of the fact that the State Constitution prohibits such structures. With this fund, the purchase program has been continued until the total acreage in the Adirondack and Catskill preserves on October 1, 1928, was 2,109,097.19 acres. The total expenditures from the 1924 bond issue, together with the outstanding contracts and appropriations, amounted to \$2,008,755.41, leaving an unencumbered balance of \$2,991,244.50

available for further acquisitions. This sum should be ample to continue the program for about four years more.

The land acquisition program of New York has passed through two distinct periods: First, that between 1890 and 1909, when the legislature appropriated, from current funds, sums of varying amounts at irregular intervals; and secondly, that from 1916 to the present time, when lands were acquired from bond issue funds. It is safe to assume that the results obtained during these two contrasting periods are typical of the two methods. In the first instance, on account of the lapses between appropriations and because of the varying amounts appropriated, it was impossible to set up any regular force of appraisers and title examiners, or to carry forward any definite policy. Land during this period was cheap and the prices paid were low. The appraisers were employed necessarily at only irregular periods and often on a per diem basis. Little opportunity was afforded them to compare their appraisals of various tracts. The reports and maps relating to these early purchases are exceedingly meagre.

The examination of titles was more or less perfunctory, as is indicated by the existing title records to much of the land acquired during that period. In general, tracts were acquired for no particular reason except that they lay somewhere within the Adirondack and Catskill areas, and could be acquired at what seemed to be a reasonable figure. There was at the time considerable criticism that the state was paying too much and that large landowners were unloading worthless properties. Many areas which could have been acquired had there been a forward looking policy

of acquisition, remained in private ownership because there were not sufficient funds available to acquire them.

Under the bond issue purchase program, however, it was possible to establish and train a competent force of title examiners, surveyors, appraisers, etc., who, after several years experience, became exceptionally skilled in their respective duties. A comparison of the detailed appraisers' reports filed with every proposal to purchase shows that the prices paid have been consistent during the entire bond issue program and oftentimes furnish a clinching argument on debated matters of price. The size of the fund made possible the setting up of a comprehensive program covering all phases of land acquisition, and a detailed analysis of the expenditures under the first bond issue shows that no phase of the program was neglected.

Due to the large amount of title work involved, a definite routine was established in the Title Bureau, which provided for the filing of the searches and examiners' reports of title, as well as the official approval of that department, which is in very great contrast to the earlier period.

The substantial amount of money available made it possible in the case of several tracts of great scenic and recreational importance, involving large areas where the commercial value was high, to acquire them quickly by expropriation after failing to agree with the owner as to price. Had only small appropriations been available, the acquisition of these important areas could not have been accomplished. In one instance, the awards of the Court of Claims totaled nearly a million and a quarter dollars, more than

any one appropriation during the period of annual appropriations.

A suggestion has recently been made, which has the approval of some of the most able legal minds in the State, that provision might be made for making a substantial amount of money available annually over a term of years by submitting to the people, in the form of a referendum, a proposal which would bind the legislature to appropriate yearly for a definite period a sum of money fixed in advance. Up to the present time, however, this proposal has not been enacted into law and there remains some doubt as to its legality. It may, however, provide a way by which the undesirable features of the bond issue may be eliminated and the benefits retained. Chief of these objections is the annual and heavy expense for interest charges. It is a well-known fact that the interest charges on long term bonds often equal the total

amount of the bond issue, but it would seem that if bond issues are ever proper for public purposes the acquisition of forest land by this means is justified, for the reason that investments in land and timber are permanent investments which will remain long after the bonds themselves have been retired. If it is a sound financial policy to issue bonds for comparatively short time public improvements, such as highways, state hospitals, prisons, and other public buildings, the life of which is on an average not more than 25 years, and to spread the cost of such improvements over a like period, it certainly is proper to provide the funds by bonding for permanent investments in forest land which will be of use not only during the life of the bonds themselves but which can be maintained as income producing property for the use of succeeding generations.

THE FUTURE OF FOREST PARASITES IN THE UNITED STATES¹

By J. S. BOYCE

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SINCE the experience of the writer has been largely with fungus parasites and less with insect parasites of forest trees, this paper will concern itself mostly with parasitic fungi, but the general principles discussed are applicable to both insects and fungi.

Forest parasites can be divided into two broad classes, introduced and native, and between the two there are very marked differences both as to behavior and methods of control, differences which it seems the forestry profession does not fully appreciate, to judge from the rather apathetic attitude or even individual opposition in the past to control measures directed against an introduced parasite. An introduced parasite frequently threatens the commercial extinction of a tree species; a native parasite never does so. Chestnut blight (*Endothia parasitica*) brought in from Asia is rapidly reducing chestnut (*Castanea dentata*) from its position of an unusually valuable forest tree to that of a shrub. This has already resulted in a very heavy reduction of forest land values within the range of chestnut. Furthermore, native parasites can be largely controlled by proper silvicultural practice, but it is difficult to visualize any silviculture that could control chestnut blight

or even white pine blister rust (*Cronartium ribicola*), an importation from Europe, although some aid to control can be attained with this last named parasite by maintaining a fully stocked stand of pine, so that currant and gooseberry bushes cannot find openings in the stand in which to establish themselves. For most introduced parasites direct control is necessary, and direct control is expensive.

After an introduced parasite has been discovered there are two courses open—do nothing and let a tree species be wiped out, either because it is not considered valuable enough to save or because it will be replaced by other valuable species; or apply direct control measures. In some cases both courses may be followed, as with chestnut blight, when the policy of apathy was replaced by action after the parasite had spread beyond hope of control. Justification for this policy of following the line of least resistance may be had if in the future the chemist reduces wood to cellulose and lignin so that one species is as good as another for the end product. Red spruce (*Picea rubra*) would then have no advantage over red maple (*Acer rubrum*) for pulp, or western white pine over white fir (*Abies concolor*) for boards. But it does not seem advisable to let our action against introduced parasites be influenced until this possibility becomes an actuality. Furthermore, the decision as to whether

¹ Presented at the annual meeting of the Society of American Foresters, New York, December 28, 1928

or not a species should be protected by direct control should be largely left to foresters. The rôle of the pathologist or entomologist is to thoroughly investigate the parasite, in advance of the introduction if possible, and advise as to what it may be expected to do and the methods to be used in its control.

Another argument in favor of not attempting to control directly an introduced parasite is that an exotic tree species can be used to replace the doomed native tree. The cost of this may well exceed the cost of direct control of the introduced parasite. Fortunately it is now becoming recognized that the importation of foreign nursery stock is a most dangerous practice, which at any time may result in another disastrous epidemic similar to chestnut blight or white pine blister rust, and that foreign species should be introduced only as seed and the stock grown here. But any exotic tree is an uncertain quantity and if introduced should be grown experimentally only, until such time as its desirability and success is well established. It is not until the end of the rotation that final judgment can be rendered as to the success or failure of an introduction. First, there is the problem of securing seed of the best quality from the optimum, native range of the species; second, the difficulty of proper site selection; and finally, the possibility that the species sometime in its life may be attacked by a native parasite hitherto not serious. Any one of these factors can spell failure. The Macedonian pine (*Pinus peuce*), because of its resistance to blister rust, is a possible substitute for western white pine (*P. monticola*), but the reaction of Macedonian pine to two canker diseases (*Scleroderris* sp. and *Dasyscypha fusco-*

sanguinea) common to western white pine within its natural range is highly problematical. Furthermore there is no information as to the rate of growth or form of this tree when established in North America.

Nevertheless circumstances which cannot be foreseen or controlled may some day necessitate the extensive establishment of a foreign species in this country. To meet such a situation experimental plantings of exotic species should be established in the various forest regions to determine the reaction of promising foreign species to a new environment. These plantings cost relatively little to start and maintain, but require a long time to develop and furnish complete information. The knowledge obtained by the British through arboreta and experimental plantations has been the basis for their extensive campaign of reforestation, prosecuted so vigorously since the World War.

Finally there is the possibility of developing a strain of the native tree resistant to the introduced parasite, as is now being attempted with chestnut against chestnut blight, but this too is an uncertain and time-consuming measure.

With constantly increasing intercommunication with foreign lands, there will inevitably be an increase in introduced parasites, checked in a considerable measure by quarantines. In Europe the Dutch elm disease (*Graphium ulmi*), of unknown origin, but probably brought in during the World War, is now destroying the elms and is a constant menace to the elms of this country. Douglas fir canker (*Phomopsis pseudotsugæ*) in Europe is another constant threat. There is not only the danger of introducing new diseases but that of introducing virulent

strains of parasites already present. For example in the Pacific Northwest, conifer root rot (*Fomes annosus*) is found on old stumps or dead trees of Douglas fir (*Pseudotsuga taxifolia*) and occasionally causes root and butt rot in a mature tree, but in Europe this organism commonly attacks and kills young Douglas firs.

Furthermore, the United States is such a large country, with the forests of the East and the West so well separated, that there is danger of introducing forest parasites from one of these regions to the other. It is quite possible that one of the dwarf mistletoes (*Razoumofskya* spp.) so severe on western pines might find one of the eastern or southern pines a congenial host. It is the writer's opinion that the gall forming rust (*Peridermium* sp.) on Scotch pine (*Pinus sylvestris*) discovered in New York within recent years and known as the Woodgate rust has been introduced from the West. In April, 1928, the writer found Douglas fir needle cast (*Rhabdochline pseudotsugæ*) on planted Douglas fir in eastern Massachusetts. This fungus was either introduced directly from the West or came circuitously by way of Europe. The introduction of the western pine gall rust (*Cronartium harknessii*) from the Black Hills of South Dakota to the pine plantations in the sand hills of northwestern Nebraska on forest grown stock was a serious error that should have been avoided. The movement of nursery stock from one part of the United States to another is a dangerous practice.

The system of government in this country in which the police power is vested in the states makes it more difficult to handle campaigns against introduced parasites, since a state is reluctant to spend money or antagonize its own citi-

zens for the protection of a remote state. The European larch canker (*Dasyscypha willkommii*) which has been discovered in eastern Massachusetts on European larch (*Larix europæa*) and Douglas fir is of no importance to Massachusetts, but is of grave consequence to the Pacific Northwest states.

Although the biggest single step in protecting forests against foreign parasites has been the enactment of Quarantine 37, the fact must be faced that in the final analysis quarantines must be considered as measures of delay rather than measures of exclusion, even though some parasites may be prevented from reaching this country for all time. The agency responsible for enforcing this quarantine should have the strongest support of all those genuinely interested in the ultimate future of agriculture in this country. How anyone of unbiased mind can consider the losses caused by chestnut blight, white pine blister rust, gypsy moth, citrus canker, European corn borer, and Japanese beetle together with other introductions and still advocate the unrestricted importation of plants from foreign countries is beyond comprehension. Unfortunately there is reason to believe that plant bootlegging is not an unknown practice.

The respite granted by quarantines should be used to obtain as intimate a knowledge as possible not only of dangerous foreign parasites but of parasites native to this country. The fights in the past against introduced parasites have been badly hampered, not only by lack of knowledge of the virulent introduction, but of native species closely related to it. Chestnut blight was at first thought by some to be a native fungus suddenly become epidemic through meteorological

conditions unfavorable to the host, and later this idea was strengthened by the presence of a closely related native fungus (*Endothia virginiana*) on oaks. Piñon blister rust (*Cronartium occidentale*) caused some confusion in the West with white pine blister rust, from which it cannot readily be absolutely distinguished. As a defense against further introductions, it will be necessary to station men abroad to study foreign parasites in their native haunts, particularly in those countries most closely united commercially with our own, as is now being done with the Douglas fir canker.

Except from the heartrots, which will be largely controlled by a reduction in the felling age, as times goes on there will be an increase in losses from native parasites, now little considered or scarcely recognized. This will result as forests are brought under intensive management, so that trees attain the status of cultivated plants. Yet many of these losses can be avoided. Our silviculture should emulate nature, improve on her methods but not radically change them. Where nature has provided a mixed forest, the same relative composition should be maintained, for mixed stands are far less susceptible to fungus and insect attacks than pure stands. The lessened damage by the white pine weevil (*Pissodes strobi*) to northern white pine (*Pinus strobus*) in mixed stands as contrasted to pure stands is a case in point. Clear cutting should be avoided as far as possible except where it has been nature's way. In general the sudden and complete exposure of the soil resulting from this method cannot but be less favorable to the new stand. The selection or shelterwood method should be practiced and

when cuttings are made diseased and undesirable trees should be eliminated.

Stands should be reproduced naturally and planting avoided, unless no other method will serve. Experience has shown that planted stands are more susceptible to disease, particularly root rots, than those naturally regenerated. But if planting must be resorted to there are certain principles to be followed. The source of seed is highly important. The seed should be obtained from stands in a climate similar to that where it is to be used, from stands on the better sites, and from thrifty mother trees. Furthermore, plantations should be established on sites suitable to the species. This precaution seems scarcely worth mentioning, but it is often neglected. Where forest conditions have been destroyed over extensive areas by devastating fires for example, it is often difficult to completely re-establish the species which previously occupied the ground. On the less favorable situations the trees grow slowly, and readily succumb to parasites. It is not until such time as the surrounding stands are large enough to afford adequate protection that trees can be re-established on such situations. An example of this is to be seen in the Douglas fir plantations on the Mt. Hebo area in Oregon.

Planting, of course, has a definite place, but because of its strong appeal to the imagination it may be overdone. There is a decided temptation for an industry which finds one type of wood best suited for its use growing in a mixed stand, to attempt to change the mixture to a pure stand of the desirable species by planting. To the pulp industry, pure stands of spruce would be much more desirable than the mixed stands, from which

spruce now comes, but if pure stands are established heavy expenditures will ultimately have to be made for soil fertility and protection against parasites in order to maintain production, just as is now done in agriculture.

To sum up then, increased losses are to be expected from introduced parasites in spite of our quarantine laws and we must prepare to meet these unwelcome guests by carefully studying them in their

own homes and obtaining a thorough knowledge of similar native parasites, so that immediate action can be taken when the necessity arises. Losses from native parasites, now considered of little importance, will also increase, but ultimately these losses will be controlled by proper silviculture. Finally, no management plans can be considered complete which do not take fully into account the possible losses from forest parasites.

FOREST PROTECTION NEEDS IN THE INLAND EMPIRE¹

By FRED MORRELL

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THE NATIONAL FORESTS in the Panhandle of Idaho and west of the Continental Divide in Montana comprise a gross area of nearly 17,000,000 acres. In topography the area is typical of the Rocky Mountain region, with elevations varying from 6000 to 8000 feet from valley floors to crests of mountain ranges. The area is less developed by transportation routes than any of comparable size in the United States. The steel on all the railroads within the boundaries of the National Forests under discussion is barely sufficient to lay a single track between the cities of New York and Washington, D. C., and the roads, including all that are passable under the best of weather conditions, would, if connected end to end, fall 100 miles short of reaching from New York to Denver. The average of roads for townships is less than 2½ miles—and the state of Rhode Island could be hidden in a number of places so far away from the end of any road that it would take one of the world's best wilderness area enthusiasts two days of good hard hiking to find it.

The country is, generally speaking, covered with timber, young growth, or brush. There are very few open parks and fully 80 per cent of it is not passable to saddle horses except over roads or

trails. Seven and one-half million acres are covered with green timber, 40 years and over in age; 4,000,000 acres with young growth or burns not reproducing (2,160,000 acres subalpine and scrub timber). The remainder consists of barren lands, open parks, and water surface. On the burned areas are snags and down timber ranging in quantity from a few thousand to as much as 50 or 60 thousand board feet gross per acre. The precipitation during the months of June to September, inclusive, averages less than 6 inches for the 4 months. Maximum temperatures ranging from 90° to 100° F. and relative humidities of 10 and 12 per cent are common during the height of the summer season. The average annual number of man-caused fires within the area during the last ten-year period is 450 and of lightning fires 776.

The above is a general but very inaccurate picture of the fire protection problem in the National Forests of northern Idaho and western Montana, inaccurate because averages mean little in fire control. Average precipitation and average temperatures are only indicators of fire weather conditions. The longest period without precipitation and the number of successive days of high temperature and low humidities are much more indicative. In the same way the number of fires set by one lightning storm and the degree of concentration are more significant of the hazard than any quantity of average

¹ Presented at the annual meeting of the Society of American Foresters, New York, December 28, 1928.

figures. For example, the average number of fires on the Kaniksu Forest for the 15-year period from 1910 to 1924, inclusive, was 49, and the average acres burned 2850. In 1926 a series of lightning storms set somewhere around 160 fires within a 48-hour period and the final area burned was 115,584 acres. Seemingly we had been reasonably well prepared for average conditions, but that the holding of the loss to a reasonably low figure during the 15-year period was no indication of our ability to protect old forests or grow new ones is evident.

If we could eliminate the losses in 1910, 1919, and 1926, we might say that we had done a reasonably good job and that the future looks fairly promising. *But 90 per cent of all the loss since the creation of the Forests occurred in these three years.* And we are not yet prepared to prevent large losses in other years like them. It is, I think, fair to say that we are prepared to reduce them. There is no doubt in my mind that had resources of men, improvements, and knowledge of the job that are now available been available in 1910 and in 1919, the losses would have been much less, or that had we not been better prepared in 1926 than we were in 1910 or 1919, the losses in 1926 would have been much larger than they were.

During the 20-year period from 1908 to 1927, inclusive, we built within these National Forests, in round figures, 400 miles of roads; 4900 miles of telephone lines; 130 lookout structures; and 175 foremen's cabins; and built or inherited 17,500 miles of trails. In addition, there have been constructed ranger dwellings, barns, fences, etc., in proportionate numbers. Estimates based on a careful survey show that we need a minimum of

\$600,000 for construction of improvements other than roads and trails to properly equip the force now employed. At the rate we have been proceeding during recent years, these improvements cannot be installed even by using the lowest usable standards as to type in less than 10 years. At the present rate of progress, at least 25 years will be required to increase our mileage of development and protection roads to a point where we shall have one mile of road to 5000 acres of land.

Now, if a corporation in the mercantile business believed that a \$100,000 warehouse would be a good investment and its directors figured that they could devote \$10,000 a year out of income toward paying for the warehouse, they would not take ten years building it in small sections, but would, if they were able, appropriate the \$100,000 or borrow it and erect the warehouse. If the structure would earn interest on its owner's money, it would earn interest on borrowed money, and good business men would not hesitate to borrow the money with which to build it. We are not doing that with forest protection improvements. There would be consistency in the Nation's saying, "We not do plan to protect these public forests from fire. We don't see our way to spending the money that would be required to do that." But there is no consistency and no wise policy in saying, "Yes, we must protect the forests. We know these improvements are needed and that additional forces and more equipment are essential, but we can't take care of that now." It can be done now promptly and efficiently if the public can be acquainted with the need for it and shown that if the Nation is really committed to the

National Forest venture and does not intend to turn back from the plow, the cheapest way is to do it at once.

The improvements other than roads and trails needed in this particular group of National Forests *to properly equip present forces* will cost approximately \$600,000. The Forest Service is fully prepared to construct them efficiently and economically in a 3-year period. We now have available from all sources for their construction about \$60,000 per year. To complete the job in three years would require a total of \$200,000 per year. This is to provide for present organization only. An additional \$150,000 is needed to provide for additional forces that should be supplied as fast as improvements can be put in that will enable them to function properly. So that for a three-year period there should be available \$250,000 per year, or, say, \$190,000 per year additional funds. After that the maintenance and replacement costs would be approximately equal to what we are now putting into both maintenance and construction. The increased funds estimated as necessary for these purposes, viz., \$570,000, is less than 60 per cent of the average annual loss through suppression and damage during the past seven years, and the total sum exceeds by some 50 per cent the average amount spent annually for suppression during the past seven years.

The Department is equally well prepared to advance construction of protection roads at a much faster rate than we are now proceeding. The roads necessary to reduce the acres of land per mile of road to 5000 should be constructed within the next six-year period. To do this would require an increase over funds now available of \$1,000,000

per year for the six years, a sum practically equal to the average annual loss through suppression costs and damage.

Twenty some years ago there appeared in the list of questions for examination of candidates for the position of forest ranger a question something like this: "What would you do to fight a crown fire coming up a steep slope and driven by a stiff wind?" To this an applicant from Idaho answered: "I'd run like hell and pray to the Lord." That is still good advice, as everyone who is acquainted with the region knows. A fire once under way in one of the million-acre wood piles of northern Idaho can only be stopped when it reaches the crest or other favorable geographic features; where the fuel is lighter; when the wind lulls and weather conditions are otherwise favorable; and then only with a supply of men and equipment large enough to get lines in and back-fired before conditions change for the worse, often a matter of a few hours. Small fires can be readily stopped by one or a few men. Much of the money spent in fighting big ones is ineffective because it can, at best, only assist natural agencies. There is perhaps nothing unique in that situation. Effective fire control anywhere requires that fires be extinguished while they are small, but in a great interior country where men can be moved only on foot and supplies by pack train or back packing, it becomes doubly important to get fires at their inception because of the great delay in moving in reinforcements and the practical impossibility of getting large supplies of men and equipment in time to be of any value.

And yet we have been depending for 20 years and are still depending on a short-term emergency force made up of

woodsmen, farm hands, town boys, college students, and who-not, living in tents in the open, taking sights on fires from improvised instrument boards on rocks, stumps, or perched in trees, reporting fires over emergency wire telephone lines, and on smoke chasers, finding their way through almost impenetrable brush, down logs, and young growth, over distances as great as five or six miles, to find a fire and to put it out while small. And on the average, the organization equipped as it has been is getting nine fires out of ten while they are small. But for reasons that it is not necessary to discuss before a group of men experienced in forest fire work, there will always be the occasional fire that will reach crew size, and to get that fire we are depending on moving crews over long distances by trail, sometimes as far as 50 miles. Until those distances are very materially reduced, through construction of roads or the development of air transportation, we can hardly hope to give the kind of protection needed for a well-managed forest property.

It will perhaps be helpful here to enlarge the picture so as to give a glimpse of the needs for all of the National Forests, because while the Inland Empire is the least developed and considering the fire hazard perhaps the most in need of protection improvements, a similar situation prevails elsewhere; and in parts of the West values destroyed are much higher per acre burned. The district foresters' estimates for protection and administration improvements, except roads and trails, for all of the National Forests, are \$3,500,000, and to complete them within a three-year period would require approximately \$1,000,000 per year over present funds available. Many of the

development roads carried on the estimates and desirable from the standpoint of development of the National Forests in the less hazardous fire regions are perhaps not urgent from the protection standpoint. But to complete the system of roads urgently needed for protection now, within a six-year period, would probably require an increase of not less than \$3,000,000 per year, or twice present appropriations for all of the National Forests.

The Forest Service is the first and largest protection agency in the field. It should stand as a recognized authority in fire protection as in other lines of forestry endeavor. It has sought and secured appropriations out of which to lead and direct the work of reforestation on private and state lands. Its own particular areas on which to demonstrate that the job can be done and to show how it should be done are the National Forests. Unless the federal government demonstrates that control of fires is feasible on the National Forests to the point of reducing fire losses to an insurable risk, the influence of its agency, the Forest Service, in bringing about fire protection on private and state lands is going to be of little value.

These are the most urgent needs as I see them for protection of the National Forests in the Inland Empire. There are needs for equipment, for research, for better organization, for better trained men, and, as we can equip them, more men, but first of all we need the every day necessities of shelter, communication, and travel. And we need them now. They are the same things that we have always needed, always intended and expected to get, and ultimately will get. Their installation will not stop all fire

losses and suppression costs, but will reduce them sufficiently to offset their cost within a very few years.

The most productive timberland in the Inland Empire is in private ownership. Most of it is under organized protection, and the associations are receiving federal assistance under the Clarke-McNary Act. The percentage of land burned over from year to year is considerably higher than on the National Forests. The most urgent protection needs on that land are:

1. Better disposal of slash following logging. There are not more than two chances in ten that cut-over areas on which slash has not been piled and burned will not burn and destroy all trees left standing and all young growth before it will have decayed beyond the point where it is a serious menace. Present state laws give the state foresters authority to require piling and burning, but enforcement of the laws is extremely difficult without genuine coöperation on the part of operators. A review of last season's operations shows that in North Idaho on only about 15 per cent of the areas cut over during the year has a reasonably satisfactory job of piling and burning been done.

2. Assurance that the present association system will be continued. The associations were first organized for the protection of valuable stands of operative timber. Lumbermen were interested not in growing new forests, but in protecting what they had until it could be converted

into manufactured products. To do that, it was necessary to give some protection also to their cut-over lands. Under operation of the Clarke-McNary Law this protection of young growth has been extended and improved, and while still far from adequate is encouraging. The danger is that it may break down through the associations' disintegrating, through contraction of their boundaries, as the areas of cut-over land become larger and those of virgin timber smaller. In Idaho, the compulsory patrol law gives the State Board of Forestry authority to levy the protection costs against all forest land. But this will not insure protection for that land which is allowed to go to the counties for protection charges and taxes. Some of it is going that way, and there is grave danger that the area of no-man's land will increase to a point where it will seriously threaten the continuance of the association system.

Hope for the land yet to be cut over must rest on slash disposal that will help to fireproof the areas and at the same time leave values in residual stands that will be worth the costs of protection to their owners. For the bulk of the land already cut over, and largely devastated by broadcast burning of slash and repeated fires, hope must rest largely on public ownership. Perhaps the state and the counties should acquire some of it, and there must be a largely extended program of federal acquisition to insure the growing of new forests on the privately owned cut-over land as a whole.

A BASIS FOR DETERMINING PROPER EXPENDITURES FOR FIRE PROTECTION¹

By LEONIDAS COYLE

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THE CONDITIONS under which forest fire protection must be carried out are so widely varied, that in the short space of time allotted I am going to confine myself to a discussion of the conditions with which I am most familiar. Briefly, these conditions exist in a region where the risk is practically entirely from man-made fires, caused by railroads, smokers, camp fires, brush burning, saw mills, and miscellaneous other human agencies, which create such a bad hazard that without control public or private forestry would be impracticable.

It is self-evident, even under the worst possible fire conditions, that if enough money were spent, a protective organization, absurdly intensive and expensive, could eventually eradicate all risk from forest fires; or that, with no expenditure, or no organization for control, the resulting loss from fire would make all paying forestry impossible. Somewhere between these two extremes is the practical mean that it might benefit us to discuss.

An effort of any kind, fire protection included, costs money; and, as forests saved from burning from a practical standpoint mean money saved, we have the common factor of dollars and cents with which to compare protective effort and the result of such effort in the value

of property saved from burning. It is obvious that such expressions as a cost of five cents per acre for protection, or one per cent of forest burned, mean little unless we convert these terms into a common factor of value.

This means that we must estimate the values in any forest property which we intend to protect before we can form any idea of how much we should spend in protecting it. Nothing could be poorer business than to spend too much money in keeping up a costly protective system where the forest values are so low as not to warrant the expenditure, *unless* it would be to under-protect where the values demand more, with resulting constant and recurrent loss.

If we analyze fire hazard we find two factors, one of which we might call passive, the other active:

First, the passive factor, which is furnished by the property owner or other agency, and which maintains for one reason or another the condition that makes forest fire possible; in other words, furnishes the fuel.

Second, the active factor, which produces the flame or spark that sets this fuel on fire. This factor is furnished by the general public, and includes railroads, campers, smokers, brush burners, and other miscellaneous agencies.

Therefore, it seems that the responsibility for forest fires is never due entirely to one agency, and the question naturally

¹Presented at the annual meeting of the Society of American Foresters, New York, December 28, 1928.

arises—in what proportion should each of these agencies furnish the necessary money for protection?

Of course, it might well be argued that the private owner is justified in spending one dollar if by so doing he can save a dollar and five cents. Anything saved is profit. The expenditure of public funds could hardly be justified to this extent, unless forest lands were enormously taxed; otherwise, it would amount to a government subsidy. On the other hand, since the general public is partly responsible, the government should assume some responsibility so as not to handicap the forest owner by expenses caused by circumstances beyond his control.

Forest fire protection is more or less in its infancy. We have not the years of experience and study behind us to furnish sufficient data and information for our purpose. Underwriters and other organizations have studied the problem of fire in ordinary business, and through research and statistics have accumulated valuable data and information. Civic fire organizations have back of them years of experience from which we should draw valuable information. It seems that a fair analogy could be drawn between the two that will help us in solving our own problems.

Forestry, as a business, must be on a par with the average business to succeed. Unless the cost of operation is less than the profits, it will fail. The cost of fire protection is an overhead expense incident to forestry, and is common to all business. This item is vital in forestry, as it is in any business. Business is competitive, and it must fail or succeed on the competitive basis. Overhead makes the difference between profit and loss. If fire protection costs more in forestry than it does in the

average business, then this fact should be taken into consideration and allowances made. Determination of this is vital to forestry.

We do not know what the risk is from fire in forestry; but we do know this, that as yet there has been no satisfactory basis for fire insurance from an economic standpoint, in so far as forestry is concerned. Until this risk has been determined, we must turn to every source of information. Naturally, we investigate conditions in the average business (if there is such a thing as average business), and from these and other data we must build up our standards.

In New Jersey, in making a rudimentary study of these conditions, fifteen of the largest cities in the state were used as a basis. These cities were used principally because statistics were available and because they presumably had adequate fire protection. It was found that for every hundred dollars' worth of property subject to fire damage, 49 cents was set aside from the taxes and spent by the government for the protection of private properties from fire. This amount of protection resulted in keeping the loss in burned property down to 42 cents on every hundred dollars' worth of such property. The annual cost of organization plus the annual loss in burned property therefore amounted to 91 cents for every hundred dollars' worth of property. In other words, almost 1 per cent is paid annually, directly or indirectly, on account of fire hazard.

Comparing these figures with those of the forest fire service in New Jersey, we find that the cost of protection is 31 cents for every hundred dollars of forest capital, against 49 cents for the average business. The loss from fire for the forest is

\$2.50 against 42 cents in the average business. These figures make no pretense of being accurate, but are approximately correct, perhaps enough so to form a basis for discussion.

Equity demands that one hundred dollars' worth of property in the forests should have the same call on public moneys as one hundred dollars' worth of property in the cities. There is a great difference between what the forest taxpayer gets for his taxes and what the city taxpayer gets for his taxes. Police protection, fire protection, and other services are not received by the forest taxpayer in the same degree as they are received by the city taxpayer. In the case of fire protection, there is a difference of nearly 50 per cent. The forest owner, under these conditions, has just cause for complaint. This handicaps forestry. Can forestry overcome this economic handicap?

The average business is insured on an economic basis; forestry is not. When forestry is insured on an economic basis, comparable with that of the average business, then forestry can compete with the average business. It is impossible to think of forest fire protection unless we take into consideration forest fire insurance. In the final analysis, these two things mean much the same. When it can be shown that we protect the forest against fire as adequately as we protect other business against fire, we should get the same rate of insurance; and when we get this rate of insurance, we shall have reached our first objective.

Statistics from the underwriters' publication show a general figure for insurance of 89 cents on one hundred dollars for the average business. Of this they

show that 50 cents is expended for reimbursing the insured for fire loss, and 39 cents is expended for overhead. This overhead includes work now done by government organizations in research and statistics and public education. It is reasonable to suppose that, when as much money is spent for forest fire protection as is spent in the ordinary business for protection, we shall get a comparable immunity from forest fire loss. This may, or may not, be true; but until we have tried it, we shall never know. Fire loss varies in different localities; but it is safe to say that in general the forest owner pays a greater amount for fire loss, taking into consideration all expenses, insurance included, than the proprietor of the average business. Conditions such as we have been discussing show that forestry carries an undue share for protection in comparison with the average business, and that the general public, which benefits and will benefit far more from forestry than it does from the ordinary business, considering the value of watersheds, recreation, etc., contributes less. Until adjustment has been made on a basis of equity, forestry will be handicapped.

In conclusion, the object of this paper is to bring up for discussion three questions:

1. What is the proper ratio between forest capital and the annual amount spent for forest fire protection?
2. What is the ratio between what should be paid directly by the private owner and the amount paid by a government agency?
3. What is the degree of protection necessary for economic insurance?

WHO SHOULD BEAR THE RESPONSIBILITY OF PROVIDING FIRE PROTECTION ON LANDS OUTSIDE THE NATIONAL FORESTS?¹

By CHARLES G. DUNWOODY

Director, Department of Conservation, California Development Association

WHOSE responsibility should it be to provide fire protection outside the boundaries of our National Forests? During the past decade this question has revolved in the minds of those who seek the ultimate establishment of a sound and lasting forest policy for the several states and the nation as a whole. Much study has been given to this problem by many well qualified individuals, a number of whom have advanced at one time or another the germ of a good idea which has been enthusiastically received by those interested, and then dropped into oblivion for lack of adequate machinery with which to carry it out.

Let us for a moment briefly take stock of what comprises the area under discussion and what relationship it bears to the general welfare of the state. We have in California 19,000,000 acres of National Forest lands which are under the protection of the federal government. Bordering these lands we have approximately 30,000,000 acres not in federal ownership requiring fire protection to safeguard hay, grain, timber, forage, and watersheds. We find our entire agricultural and industrial systems intimately tied up with water development in which

the mountainous lands and foothills outside of the national forests play a rôle of major importance. We have learned through carefully planned experimental work that these areas, if covered with forest growth, serve as the catchment factor in producing that well regulated stream flow so necessary to the advancement of our great agricultural enterprises.

Munns, in his report of 1923, points out the destructive results that follow in the wake of the removal of vegetative cover. Recent investigations by the California Forest Experiment Station throw some further light on this problem. Detailed experiments carried on during the past two years prove conclusively that as the vegetative cover is removed and the organic material is lost, water will rapidly run off from the surface, carrying with it enormous quantities of silt. Wherever the blanket of trees or brush with its litter and duff is destroyed, torrential rain falling on the bare soil compacts it, while the fine soil particles become a muddy mass soaking into the soil, sealing up the fine pores at the surface, and directly tending to reduce the capacity of the soil to absorb water. Following this, the water runs off from the surface, carrying with it the rich mantle soil, and in its downward course gathers larger and larger material.

¹ Presented at the first annual meeting of the California Section, Society of American Foresters, San Francisco, December 20, 1928.

On the burnt-over experimental area from 30 to 46 per cent of the rain immediately ran off of the surface. On the areas where the vegetative material was left intact as little as 1 per cent was credited to surface run-off, the remainder soaking into the ground. The amount of sediment coming from the burned area was at least one hundred times as great as that from the unburned area. These experiments, while not conclusive nor applicable to all soil types, in a general way confirm Munns' observations.

In 1921 the State Legislature enacted Chapter 889 of the Statutes, which reads as follows:

SECTION 1. It is hereby declared that the people of the State of California have a paramount interest in the use of all the waters of the State and the State of California shall determine what waters of the State, surface and underground, can be converted to public use, or controlled for public protection.

* * * *

SECTION 3. It shall be the duty of the state engineering department to determine the maximum amount of water which can be delivered to the maximum area of land, the maximum control of flood waters, the maximum storage of waters, the effects of deforestation and all possible and practicable uses for such waters in the State of California.

The state, through this act, definitely recognized its responsibility and its jurisdiction over the waters of the state. It must of necessity recognize its obligation to protect and regulate the use of lands which are the sources of these waters.

It is inconceivable that any sound policy for the development of our water resources can be promulgated without giving adequate consideration to the protection of the watershed areas. Under

the statewide plan there are recommended for construction over 200 reservoirs for water storage. Such projects as the Mokelumne, the Oakdale, and the Orland have brought about the investment of millions in the construction of dams and reservoirs without any plan for the protection of the watersheds which are to feed them.

Think of it—a capital investment of millions of dollars without one cent of insurance to guarantee its future efficiency. Unfortunately the contributing watersheds to important irrigation projects are mostly in private ownership, the owners of which, for the most part, have no direct interest in these areas as watersheds. Chaparral and brush lands which are promiscuously burned for the sake of increased grazing facilities may temporarily benefit the owners of such lands, but they certainly are a definite menace to the integrity of the irrigation systems below them. The irrigationist more often depends on water arising outside of his county and has no way of protecting himself against the misuse of lands comprising that watershed.

In the light of these facts it would seem logical that the state should begin to exercise its police powers in order that water development may proceed in a logical and safe manner. To do this the state must put into effect a rigid protection system. This will require an organization of greater magnitude and far larger expenditures than has ever been available heretofore. It may be necessary for the state to go so far as to compensate the private owner for the losses sustained through a modified management of his lands, in order that the greatest good for the greatest number may prevail. The state has a paramount interest

in protecting its water supply. Many other benefits may be expected when successful protection against fire is attained. The wild lands of the state can be made to produce timber, water, forage, and game in far greater abundance if adequate fire protection is provided.

In 1925 ten states in the Union made higher appropriations for forestry purposes than the state of California. While California was spending \$98,000 for these purposes the little state of Connecticut spent \$180,000, New York \$2,000,000, Pennsylvania \$630,000, New Jersey \$234,000, and Massachusetts \$352,000, and not in one single instance were the problems of any of these states as acute or as vital as those existing in California. This problem is a critical one and will require the utmost efforts of the state if we are to safeguard our water wealth. Its solution is of vital interest to every tax payer in this state. Without question he who benefits most from the protection of these areas should bear his proportion of the responsibility.

We must admit that a large portion of the land in question represents a great public utility created by nature to meet the vital needs of a great population. It can be likened unto a great catchment basin, which, if made ineffective, would cost the state many millions of dollars to artificially replace. We must also admit that, although the majority of this area is in private ownership, the benefit derived by the private owner from efficient fire protection may be termed infinitesimal as compared with that accruing to the general public.

What is being done to meet this serious situation? In 1921 the State Legislature passed Senate Concurrent Resolution No. 27 which directed the State

Board of Forestry to examine these areas and report back to the legislature at its next regular session the situation and approximate acreage of such areas as are most valuable for reforestation or re-covering with other vegetative protection, and to report a plan whereby they may be reforested or otherwise covered with protective vegetation.

Pursuant to the resolution the State Board of Forestry made an investigation, and at the 1923 session of the legislature rendered the following report:

1. Some 2,201,700 acres were in a denuded and devastated condition.
2. Some 1,300,000 acres of potential forest lands required reforestation.
3. Hydraulic mining and subsequent denudation of watersheds by fire were causing an annual expenditure of \$5,000,000 for flood control work in the lower Sacramento Valley.
4. From 1917 to 1922 from one-half million to three-quarters of a million acres of land were burned over with an average annual loss in tangible assets of about \$800,000.
5. Conservation of water and prevention of erosion were recognized as the outstanding problems in the state.
6. The most effective plan for the reforestation and re-covering of denuded lands was stated to be careful, systematic, and effective fire protection.
7. It was recommended that the state take active leadership in fire protection.

Now let us compare the situation as pictured in 1923 with the conditions of today. The average number of fires has increased from 2,300 to 2,600 per year. Losses to tangible property have exceeded two and a half million dollars per year. The area burned during drought years has exceeded a million acres per

year. What has the State Legislature done to remedy conditions as outlined in the 1923 report of the State Board? We might say practically nothing. True, we have a slightly improved skeleton state fire protection organization, but, in its present status, it is totally inadequate to handle its tremendous task. Again we find ourselves checkmated for lack of machinery. At present we lack that one necessary, all-powerful force—public opinion—which must eventually provide for us this necessary machinery.

Our state administration is thoroughly sold to these needs but is helpless to act without the solid backing of a sympa-

thetic public. Public opinion is directed to any given question only through organized effort. If we are to hope for success in eventually solving this problem, we must be so organized that Mr. Citizen can be made to realize that, until such a solution is reached, his interests are in constant jeopardy. He must be made willing to pay the bill.

There is but one answer to the question now under discussion. It is the solemn obligation of the state of California to create and maintain an effective fire department with which to protect this vital public asset.

SOLVING FOREST SERVICE PROBLEMS THROUGH COOPERATION¹

By W. G. DURBIN

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WHILE there are members of the Society present who have been connected with the Forest Service about as long as I have, and some longer, and many who have followed the progress of forestry so closely that my paper will contain nothing new to them, I am reviewing for the benefit of the others present some of my observations during the past twenty-five years of how coöperation has assisted in solving problems connected with the advancement of forestry.

First of all, in order for a man to be a good forester, he must have a pride in his work, a desire to accomplish the most with the tools available, and ability to see a long distance into the future and to forecast accurately problems that will have to be solved. Gifford Pinchot was a man of this make-up, and the fact that he was may have had quite a bearing in the selection of the personnel of the Forest Service even to this day.

What did forestry amount to in the United States at the time Mr. Pinchot became Chief of the United States Bureau of Forestry thirty years ago? Practically nothing as compared with what it is today; however, Mr. Pinchot's ability to look into the future enabled him to see what was going to take place, and he made every effort to be prepared to meet

the big job when it came. Mr. Pinchot was a politician in so far as the word applies to a statesman. He was a friend and associate of President Roosevelt. When Colonel Roosevelt became president, Mr. Pinchot no doubt saw that the time was nearing when the remaining unappropriated timber lands of the United States would be withdrawn from entry and become National Forests. With this thought in mind, the chief forester's great concern was to give training in field work both to his own men and to others who wished to take up forestry as their profession. The entire personnel of the Forest Service under appointment did not exceed the number employed on a single National Forest of today. However, young men were taking up forestry and real field jobs must be provided in order that these men's training in field work would be sufficient to enable them to take up intelligently the work that was bound to come with the setting aside of practically all the remaining Government timberlands for National Forest purposes.

It was not Mr. Pinchot's idea that the resources of these forests were to be bottled up, as the term Forest Reserve would imply. His idea was that every resource should be made available under a common sense conservation policy. He knew that he must have trained men to handle the timber resources, men capable of properly laying out National Forest

¹ Presented at the first annual meeting of the California Section, Society of American Foresters, San Francisco, December 20, 1928.

units, working circles, timber sale boundaries, etc. To get such training required experience in field work, but where was there an opportunity for this? The appropriation for the entire Forest Service did not amount to much more than what it takes to cover the expense of running a couple of National Forests at the present time. Furthermore, the men going into forestry were all in the East where the timberland had long been in private ownership. However, this training problem had to be solved; therefore a plan was evolved whereby a group of these young men would be sent out with a trained forester to conduct timber surveys or studies on private lands.

On timber survey jobs the owner of the land coöperated to the extent of sufficient funds to pay the subsistence expenses of the crew. This meant that the Government was getting the men trained at a cost of \$25 per month, the standard wage paid for men with a forestry education. The owner of the land got a good job done for what it cost to subsist the party. So far as I know, this was the first coöperative work of the Forest Service and was what might be termed the germ of coöperation. This very small beginning may be considered as the corner stone of the huge structure of coöperative work that the Forest Service has since built up with individuals, local communities, states, and even nations.

I have tried in the foregoing to picture the work of the Service as I saw it twenty-five years ago. Where are we today? How much progress have we made in our work? I believe that a good measure to use in answering this question is to compare the number of men now in the Service with the handful in the Service prior to the taking over of

the National Forests by the Department of Agriculture, and also to compare the knowledge gained over a period of years with the knowledge of a few men who had little insight into the big problems of forestry. There is no one, not even the most skeptical, who will not admit that great progress has been made along all lines of forestry endeavor. But even with this start we are years behind with our work, with many great problems still to work out.

It has always been the policy of the Forest Service to coöperate to the fullest extent with all other branches of the Government, with lumber companies, municipalities, and organizations of all kinds which are interested in the work of the Forest Service, and this is as it should be. The further the Forest Service is able to go into this kind of work the greater will be the advancement of forestry. No plan has ever been evolved that provides better means for giving the other fellow a good understanding of our problem than close association. In most instances the best way to bring about this association is by coöperation. This does not mean that we are going to do the work that he knows how to do, or that we are going to do much more for him than he does for us. It does mean, however, that we are going to work together; we are going to help him solve his problems and he is going to assist us in solving ours. Probably in no case has coöperation ever yielded greater benefits than that of livestock associations. They have in many instances been the means of bringing about an understanding between the Forest Service and the grazing permittees that enables the Service to put into effect in a short time methods of grazing administration that

without the assistance of the association would have taken years to bring about.

Lumber companies of today coöperate almost universally where they are in a position to do so. Many of them now employ foresters who in many instances are men who had their early training in the Forest Service. Twenty-five years ago, most of the lumber companies frowned upon the policies of the Forest Service. Today, when we approach the head of a lumber company and explain what we wish to do, we usually find him in a receptive mood and willing to do more than his share to help solve any problem that appears to be in the interest of forestry or the lumber industry. It has been the policy of the Forest Service, and I hope it always will be, to consider fully the other fellow's point of view and work with him where possible, rather than to try to rule with an iron hand.

Possibly one of the most beneficial means of coöperation the Service has is the training of men for positions outside of the Service. Every year numbers of top notch men leave the Service to take up other work or similar lines of work. At times it has seemed that the Service should be in a position to make its work sufficiently attractive to hold such men; however, is the Service not receiving greater benefits in the long run by having top notch men filling outside positions where they are coming in contact with people that it is hard for the Forest Service to reach? In my opinion, every time the Forest Service loses a top notch ranger, timber sale man, grazing man, or head of a division, the Service has taken a long step in the advancement of forestry. This man should take with him the Forest Service point of view, and

he should not only be a coöperator himself but the means of getting coöperation for the Service from those with whom he has influence.

Federal legislation has played a large part during the last few years in the advancement of forestry. Take, for example, what it has meant to the states having a forest policy. Such coöperation has made it possible for many state foresters to make even as much or more progress in their work than has been made during the same period by the Forest Service. In almost every instance, the states have taken full advantage of the offered coöperation, which again demonstrates what a helping hand may mean in time of need. This coöperation so far as the State of California is concerned, together with state legislation of the last few years, has meant a lot not only to the state but to the Federal Forest Service as well. The state, through coöperation with other agencies, has now a real forestry organization that is coöperating with all agencies interested in forestry from one end of the state to the other. This coöperation takes into account almost all phases of forestry from the raising of trees for roadside planting to the fighting of forest fires. No longer do we see fires outside the National Forest boundaries burning for days unattended. Legislation and coöperation have made it possible for the State Forester to have a protection organization. This organization coöperates to the fullest extent with the Federal Forest Service through a mutual agreement that has fully demonstrated that coöperation along the border line is the only method of protecting these areas from forest fires.

The advantages gained through coöperation in fire protection with the state, counties, and smaller subdivisions, have meant much to the advancement of forestry. Yet there is much to be done before we reach anything like a satisfactory solution of the forest fire problem. The desire of hundreds of thousands of people who use the forests that they be kept green and the appreciation they have for the little kindnesses shown them by the guardians of the forest have done much to prevent man-caused fires. Both the state and federal government should coöperate to the fullest extent with this class of people by making the forests more attractive and by installing such conveniences at camping places as time and funds permit.

The big enemy of every forest service, whether state, private, or federal, is man-caused fires. This enemy must be stamped out and the way to do this is through coöperation with the agencies having power and influence to create public sentiment that will cause all persons to use the same care and take the same interest in fire prevention that persons engaged in forestry do.

In the foregoing, I have dealt with coöperation as it has affected the larger phases of our forestry problem. We have, however, our local problems to deal with that should by no means be overlooked. One of these is the future life and welfare of the communities dependent on the National Forests. If the people have the proper attitude towards

our policies, it is not a difficult matter to work with them and get them to see our point of view. However, we must at all times be mindful of these people's interests and do nothing that will infringe on them. In some cases where a community depends on the manufacturing of National Forest timber we almost hold the future welfare of the community in the hollow of our hand. Here is where the cutting of timber on a sustained yield basis plays such an important part; therefore, if we can advance the life of the community by a carefully thought out plan of forest management, grazing management, or a suitable recreation plan, it is our duty as good foresters to coöperate with the community to this extent even though such a plan may seem to be disadvantageous from a Forest Service point of view. This coöperation, then, with individual or community should be uppermost in our minds and influence to a large extent our future work. The future holds promise of many problems great and small wherein the Service must necessarily work hand in hand with the people themselves to work out a solution common to both needs. With years of experience behind us and the knowledge obtained through the steady upbuilding of coöperative work and understanding, we should, I believe, be able to face the future with a feeling of pleasure and anticipation for the duties to be done and the work to be accomplished.

LOCAL VALUES OF PERMANENT FOREST MANAGEMENT¹

By M. A. BENEDICT

Forest Supervisor, Sierra National Forest

IN THE MANAGEMENT of our National Forests, we have two definite responsibilities—our obligation to the government or general public, and our obligation to the local communities in so far as they are affected by the forest. The greater national obligation is fulfilled when we handle the timber resources on as nearly a sustained yield basis as it is possible to attain. The most successful forest administrator is he who attains this goal through a proper recognition and solution of the local problems. These local problems or values are divided into two general classes: First, the supplying of forest products to the local region; second, the effect on local affairs of industry incidental to the production of forest products.

Because my comments deal with local aspects I shall try to be specific. In no region in California, or perhaps in the country, is the future development of agricultural and industrial prosperity so closely linked with the Forests as it is in the San Joaquin Valley. Its present and future development depends entirely on a water supply that is first used to generate power for its industry and then used to water the lands for agriculture. The bulk of this water comes from the National Forests.

The first duty of the forester then is to preserve the watershed, and no plan of management that does not keep this in front can be even considered. It is apparent that the wood requirements of such a region are a secondary consideration and that they must be constant and adequate if the region is to maintain its productiveness.

With these objectives in mind, how are we to handle the Forests in order that they may be attained?

Sustained yield, it is believed, not only meets the national obligation of the Forest but through its application tends to stabilize the local industrial situation and promises the region a constant supply of forest products. There are two methods of applying this principle: by several comparatively small units, or by one or two extremely large operations. Because the intervening foothills form an expensive transportation barrier between the valley and the timber, we abandoned the small operation plan; and because we had in place a large manufacturing plant capable of handling the entire remaining forest capacity, we decided to build our plan around this plant. This decision involves many local problems but it is believed that the best local interests will be served by having a large central plant working up almost the entire output of the Forest. Under any other system this plant would go out of existence in 10 or 15 years with the attendant unstabil-

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izing adjustments in the local situation. Instead the plant will form a permanent industrial asset to the community. In return we shall expect the support of the local region for the plan itself and relief from the pressure of new operators who in the future may desire to disrupt the plan.

This involves, of course, a thorough education of the public and especially of chambers of commerce and other boost bodies whose constant aim is new industrial operations. We have already started on this educational campaign.

I think a brief mention at this time of the private land situation within the National Forest working circle may not be amiss. In this extensive area under sustained yield the same principles of management are applied to the private land. In justice to the owners an acquisition program must be initiated either by the operator or the government. Past misuse of private timberlands in this region has seriously affected the forest capacity and in the minds of the public its watershed value. Local public opinion is ripe for regulatory action and only lacks intelligent leadership. In my opinion regulation of private cutting will eventually follow the adoption of sustained yield on the Forests, and it is distinctly a forester's duty to direct public opinion along sane and practical lines. On the other hand the lumbermen must wake up to the fact that the public has an interest in their lands and must regulate themselves, or they may be subjected to drastic control that may or may not be practical. While some progress has been made in leaving private land in shape for forest production, much remains to be

accomplished, and in my opinion the forester, be he employed privately or publicly, must meet his public obligation and insist on regulated cutting.

From a local standpoint sustained yield will always be subject to assault on the grounds of monopoly, but as time goes on and the communities affected learn at first hand the other and more important stabilizing effects, we can expect sufficient public support.

One of the major arguments will be that in a big operation there will be a large volume of mature stumpage of high value that should be cut. Unless we abandon sustained yield this will always be so during the first cutting cycle. The effect of this may be minimized by the adoption of a modified selection system based more on economics than on silviculture. My prediction is that private forestry will be based on this principle and that federal practice will be modified at least to put silviculture in its proper place from a local revenue standpoint. The application of this principle would make for a real selective system and consequently a shorter cutting cycle.

To summarize, permanent forest management benefits the local communities by:

1. Stabilizing industry and employment.
2. Insuring a local supply of forest products.
3. Preventing too rapid changes in condition of watersheds.

In addition, sustained yield gives the forest administrator a reliable source of fire suppression forces, by no means a trivial matter.

ARE FORESTERS KEEPING UP WITH FORESTRY?¹

By S. R. BLACK

Secretary, California Forest Protective Association



AS THE CAPACITY and fitness of the professional forester been developing as rapidly as has the forestry movement as a whole? At this first annual meeting of the California Section of the Society of American Foresters it is perhaps worth while to pause and take stock of our own personal development and compare it with the growth of forestry in the United States and in our own state.

Each of you can easily review your own abilities and professional accomplishments. For the sake of comparison, let us briefly review some of the major developments in the forestry program that have occurred during the last five years.

Nationally forestry has made tremendous progress. After many years of groping about and feeling the way, the nation has proceeded in rapid fire order to establish a workable, practical, and definite forest policy.

In June, 1924, President Coolidge signed the Clarke-McNary Law, probably the most important piece of forest legislation since the Weeks Law of 1911. Under this law the nation agreed to meet the problems of forestry in coöperation with the states. I think this policy of coöperation has tended to draw together and focus the united support of all agencies upon further development

of the forestry program. While funds for forest protection under the law were perhaps of the greatest immediate importance, it remains to be seen whether or not the section providing for a thorough investigation of forest taxation may in the long run approach in importance the protection sections of the act.

Last year Congress passed the McSweeney-McNary Law, which provided for a coördinated program of forest research, a very definite step forward. Congress also passed the McNary-Woodruff Law, which provided for a tremendous extension of National Forests throughout the eastern states. In years to come the result of this law should be the uniting of the interest of eastern states with that of western states in forest protection and in the solution of other forest problems. It probably will tend to eliminate the questionable feeling expressed in the past that whereas the East paid the taxes that supported the government, the West got the benefit from forest protection expenditures.

Adoption by Congress of those three very important laws—the Clarke-McNary Act, the McSweeney-McNary Act, and the McNary-Woodruff Act—has given the United States a remarkably sane and substantial platform upon which to build the rest of the national forest policy.

Within the last five years the United States Government has for the first time recognized its duty to protect from fire

¹ Presented at the first annual meeting of the California Section, Society of American Foresters, San Francisco, December 20, 1928.

timber located upon the Public Domain. True, appropriations for this work are entirely inadequate, but the principle is established.

Within the last five years also the United States Weather Bureau has developed its fire weather forecasting service. This is of great importance to forest protection, and in many ways has given to foresters an entirely new concept of the fire control problem.

Two years ago Congress established a Federal Forest Experiment Station in California providing facilities for thorough investigation of the many complex problems of forestry peculiar to this region.

After the war, administration of the National Forests was greatly handicapped because of the rapid turnover of personnel. This difficulty was largely met by the national reclassification act which materially increased salaries of Forest Service employees. Congress then followed up this act by passing the Welch Act, again increasing federal salaries and placing them on a par with, or even above, salaries for similar work outside of the Service.

Taken as a whole the advancement of forestry in its many branches has made phenomenal national progress in the last five years.

Not to be outdone by the federal government, the State of California has also shoved the forestry program ahead in an extremely heartening manner. We have in California the compulsory patrol law fostered by the landowners themselves, and marking an achievement of outstanding importance. Few indeed are those states other than California in which all forest lands, whether cut-over or timbered, are protected from fire. In 1926

the people of the State of California ratified a constitutional amendment designed to give the private owners of reforesting lands a chance to carry on their programs of reforestation without special penalty on the part of the tax collector. That constitutional amendment did not pass by a mere majority, but was given a two to one favorable vote. Reflect for a moment upon what such a vote means in terms of public interest in forestry.

During the past few years, California has adopted several very practical laws relative to the protection of forests from fires starting from logging equipment. Here again, the operator of the equipment coöperated with the state and federal forest services in the development of practical and workable laws on the subject. The state legislature has also moved to curb a public notoriously careless with fires. Trespass laws have been amended. Throwing of burning material from moving vehicles has been made a misdemeanor. Of even more importance are the changes in the game laws based on forest protection needs. The coöperation of organized sportsmen finally enabled foresters and timber owners to cut the first two weeks from the open deer season in the mountain regions, thereby diminishing a very great fire hazard.

While the legislature was engaged in enacting practical legislation for the protection of the forests, it did not neglect the means of enforcing its actions. The State Forester has been given larger and larger appropriations with each convening of the legislature. These larger appropriations have been made effective in the development of a more efficient personnel in the State Forester's Department. More rangers have been em-

ployed, better salaries and longer periods of service have been made possible, and the department has been able to build up its supply of fire fighting equipment.

The national and state forest services have not had a monopoly in the matter of forest protection and reforestation. In the last five years we have seen the development of private redwood reforestation advance from a purely experimental basis to the largest commercial reforestation project in the United States. Redwood trees are now being planted by the millions annually, and the professional forester has found an important place in the program. Protection from fire is now being furnished many portions of the redwood region, where five years ago there existed no organized protection.

A few years ago, foresters were alarmed by the practice of broadcast burning and high lead logging in the pine region. Today these bogies are practically non-existent. Broadcast burning has been discontinued. Two-thirds of pine logging is now done by tractors. The remaining third of pine logging in California is by high lead, and one-half of this third is upon the National Forests where it is subject to regulation. Where it yet remains in use upon private lands, one-sixth of the total, the damage is much less than in former years, and in several private high lead logging operations so much timber is left standing upon the ground after logging that the casual passer-by would scarcely know that the area had been cut over. Even without regulation tractor logging leaves a very fair stand of young timber uninjured upon the logged off land.

More intensive and less damaging slash disposal methods are being used; spot burning, strip burning, and more intensive protection have replaced the old broadcast burning practice. A large number of operators have adopted fairly high diameter cutting limits upon their private holdings. The outlook for a new timber crop is distinctly favorable, especially when compared with conditions existing five years ago.

The long list of federal and state forestry laws to which I have referred is of course important, but do not let the trees obscure the forest. Those laws, setting down important policies, are but the reflection of public opinion. The public is interested in forestry, in forest protection, and in the forests themselves. The growth of public interest in, and support of, progressive forestry policies is perhaps the most significant development of the past five years.

For a moment let us look backward for more than five years. In 1905 the United States Bureau of Forestry was given a large increase in forestry appropriations. The total amount outside of salaries was \$398,000. During the fiscal year 1927-28 one county alone in California appropriated for forest protection work aside from salaries \$401,922, an amount exceeding the total federal appropriation twenty-three years before.

Looking backward and summarizing the extended achievements of forestry during the past five years, one cannot help feeling that forestry is moving, that it has received enormous public support, and that it will undoubtedly go forward even more rapidly in the future than in

the past. Such tremendous development in national, state, county, and private forestry programs necessarily demands a corresponding development of individuals fitted to carry out those programs in the various branches of the forestry profession.

I leave it to you, individually, each one of you, to determine whether or not you are keeping up with forestry, to determine whether or not you have advanced as fast in personal fitness during the last five years as has the profession in which you are interested.

RECRUITING FORESTERS¹

BY WALTER MULFORD

Professor of Forestry, University of California

MR. DOE has three sons. Will has real ability. He becomes an engineer. Bob also shows great promise. He is in business. Unlike his brothers, Jack doesn't seem to have the real stuff in him. Almost a failure at school, with no clear idea of what he wants to do, or can do, he is a problem to Dad. So Dad thinks he should become a forester. Dad has been told that forestry is a life work which offers no great rewards, so he thinks it must be one in which not more than mediocre ability is required to attain real success. Dad was shocked when the professor of forestry asked him why he hadn't sent Will or Bob to the forest school instead of Jack.

Mr. Alder is one of the leading intellectual men of California; likewise a gentleman of the finest type. He has one son. Both have traveled extensively abroad. They know the prestige enjoyed by the profession of forestry in Europe. Charlie will become an American forester, a prospect keenly anticipated by both father and son. Charlie is a really brilliant fellow, with character and ideals of the finest; and practical and human withal. The professor of forestry is delighted.

There are still several weeks before college opens. When the time comes, Charlie doesn't register in forestry. He

is to become a lawyer. He had talked with two or three California foresters. Any glowing enthusiasm for their profession? None. Is it a profession in America? They hardly seemed to think so. Good opportunities in it? They left the distinct impression that "the openings" are not worth while.

These are actual cases. They are typical of what often happens; typical of the injustice that is done by our own lack of belief, our own littleness, our own shortsightedness. The result is that there is a widespread opinion among parents in California that forestry may do well enough for second-raters, but that it offers no adequate rewards for ability.

The fault is most certainly not with what the profession offers. Is it any the less a profession because as yet most of us are merely protecting our forests—or trying to—and developing their facilities and crudely utilizing their resources instead of dealing in complicated management formulæ and the refinements of Old World silviculture? "Merely" doing these things! Ours is a task more interesting, more stimulating, calling for a rarer professional skill and more able leadership, than when in a century or so policies are established, with things well shaken down and running comfortably along. I'm glad my work is now.

Opportunities? Rewards? Must I enumerate them here to foresters! To the man who sees no opportunity worth

¹ Presented at the first annual meeting of the California Section, Society of American Foresters, San Francisco, December 20, 1928.

every ounce of power he can develop in himself, no reward which makes him glad—yes, *proud*—to call himself a forester: to that man I say in all friendliness, change to some other life work. Do not be ashamed of making the change, or apologize. It cannot be expected, nor would it be desirable, that all men will like the same things, nor see in the same direction the light which makes life. BUT, don't harm the rest of us, and most of all the profession, by staying in the fold after you have become a knocker. We want foresters who believe in the dignity of their work, who make no apologies, who stand foursquare to the men in any other work, who are willing to put all their might into *making* forestry succeed. We want foresters who realize that if they themselves have not gotten as far as they had expected, the fault is nineteen times out of twenty that they have not developed their own abilities further, and the twentieth time is not anything inherent in the profession—OUR profession.

It should be self-evident that forestry must continue to recruit first class men. To assist in this, all of us who are loyal can at least speak of forestry, and live our lives toward it, in its true light: a profession, and one eminently worth while, in which the true rewards are limited only by the man himself. Why not occasionally go further and seek out the young man most promising for forestry in our local high school and make a definite attempt to attract him to forestry? I know of no other way in which in the long run we can do more to build up our future. Some of us are already sending our own sons into forestry. To do so is a real proving of the faith that is in us.

Make no mistake about this. I am not urging that these men whom you seek out should necessarily come to our local forest school. Send them where you will. Not some forest school, but forestry itself, is what will have need of them.

Webster tells us that to recruit is "to gain new supplies of men for service." *For service!* Not merely military service, but service of any kind. The important thing is that it is service.

If the greatest service is to be rendered we need constantly not only to recruit high class beginners, but also to recruit *our own powers*. In one of his most effective addresses, an impromptu one to the undergraduates of Cambridge University, England, on the subject "Success," Mr. Roosevelt brought out the fact that genius is rare, and that the great majority of eminently successful men in any field have achieved their strength because they have consistently striven to develop their mediocre powers in the highest degree. Mr. Roosevelt himself was an outstanding example of this fact. Starting with poor health and moderate mental ability, he became one of the world's strongest men of his generation. And he was striving, until the end.

The administrative problem in forestry is always to find the right high grade man to fill the position of great responsibility. Rarely is there a man of real power lacking a place in which he can prove himself. In general, if I have not found a worth while place it is because there is something in me that is not strong enough for the greater task. I have not developed my ordinary powers as I might have done. It is time I go to work on myself. Usually this is best done not by looking for positions else-

where and being discontented with the one I now occupy, but by doing the best that it is in me to do in the place where I now am. And this without too much thought for the future. Remember Emerson's statement that the world will make a path to the door of the man who makes a better mouse trap than his neighbor. The trail is open to larger things ahead. Am I able either to run or walk?

We are apt to make the mistake of thinking that success is measured by the prominence of the position we occupy. This is far from the truth. To quote once more from that same address of Mr. Roosevelt's: "I have thoroughly enjoyed my life and my work because I thoroughly believe that success—the real success—does not depend upon the position you hold, but upon how you carry yourself in that position."

The position of the forest ranger has in it all the dignity, it will in itself command all the respect, that the ranger himself has of dignity and of qualities that command respect.

We cannot all be at the top. On the one hand I should realize my limitations and be happy in the type of high grade service which it is my lot to render. I can make the service high grade no matter what position I occupy.

On the other hand, it is important that I never let ambition flag or growth cease. It is difficult in any field to keep on

growing. It does not appear that it is more difficult for the forester in his ranger cabin or his logging camp than for the mining engineer in his hole in the ground or the graduate in commerce at his gasoline service station by the roadside. In all cases a conscious effort must be made.

In this continuous recruiting of the powers of all of us who have been in the work for some time, I am wondering if there is some way in which the forest school can be of assistance at times. The school at Berkeley is your school. We want you to think of it in that way. We want you to use it. This is true fully as much for men who come from other universities and for men who have never been to any college, as for the California alumni.

If the California Section of the Society thinks well of it, I should be glad to see a definite attempt made to plan means whereby the school can assist the field men in continuing their growth. If a workable plan is found, one much-desired result would be that the field men would have helped the schoolmasters to a larger growth. The field men will have given more than they will receive.

American forestry needs steadily increasing public recognition. It needs more facts on which to base its claims. It needs other things. But above all other assets, it will continue to need able men.

REFORESTATION IN THE HUMBOLDT REDWOOD BELT¹

By W. R. SCHOFIELD

Secretary-Supervisor, Humboldt Redwood Reforestation Association

EARLY in 1923, following a study of the condition of cut-over lands in Humboldt County and the feasibility of reforesting them, there was formed the Humboldt Redwood Reforestation Association. The members and founders included twelve operating companies, two timber investment companies, and the University of California.

The objects of the Humboldt organization, as set forth in its constitution, include: Investigation of the various factors upon which successful reforestation depends in Humboldt County; co-operative work in protecting from fire cut-over lands, natural reproduction, and plantations, and also virgin timberland; land classification, to determine upon which lands reforestation activities should be centered; coöperation with state and national agencies whenever practicable in determining a definite reforestation policy; coöperation with state, national, or other organizations in the reservation and preservation of a reasonable amount of old growth redwood forest so situated that its preservation is practicable and will interfere as little as possible with the profitable operation on a large scale of the redwood lumber industry, upon which the eco-

nomic welfare of Humboldt County is based; investigation of reforestation possibilities and problems on the lands of individual association members, and planning of such reforestation as is best suited to the needs of each property; supervision of the reforestation work of individual association members.

The Association is supported by an assessment of two cents per acre upon the timber and cut-over lands of its members. The area represented in the year of its foundation, 1923, was 247,420 acres; at present the area is 293,794 acres.

Prior to the formation of the Association, the Pacific Lumber Company had established a forest nursery of five acres at Scotia on a river flat cleared of its huge stumps at a cost of \$500 per acre. This company became a member of the Association and agreed to furnish nursery stock to the other members at cost. Production began in 1923. Plantations heretofore established by member companies had been made with stock grown at the state's nursery. Because of the greater scope of its forestry work, including the operation of the large nursery, the Pacific Lumber Company employs two technically trained foresters who supervise its forestry work but co-operate closely with the Association.

Although now under way over five years, redwood reforestation still has

¹ Presented before the first annual meeting of the California Section, Society of American Foresters, December 20, 1928, San Francisco.

some important problems to solve. The principal effort has so far been to use the native species known to be best suited for reforestation. The underlying principle has been to seek quantity rather than quality production. We have yet to determine what might be demanded most at the marketing age of plantations—quantity or quality. In the selection of species, nature pointed the way. Second growth on cut-over lands up to 60 years old was available for study. Such growth, made up of redwood sprouts and seedlings of redwood, Douglas fir, and white fir, showed a per acre volume greater in some instances than that of average virgin stands. The technical qualities of the lumber and particularly the grade were bound to be far inferior to those of old growth lumber, but in yield of cellulose the second growth stands exceed the virgin stands. This fits in well with the belief of many that in the future timber values will be based upon the volume of cellulose rather than the quantity and quality of the boards the timber might produce. Studies on recently logged areas indicate that natural reproduction, mostly redwood sprouts, can be depended upon to aid reforestation to the extent of twenty per cent of the area denuded. The reforestation program therefore resolved itself into filling in the gaps left by nature with nursery-grown stock.

Most of the stock raised in the Scotia nursery is redwood 1-0 stock. Although redwood is the principal and logical species used in the reforestation work, the possible value of other species, native and exotic, was not overlooked. Douglas fir, white fir, and Sitka spruce, natural

associates of redwood in the virgin stands, all grow rapidly. Douglas fir, Sitka spruce, and Port Orford cedar were chosen as plantation associates of the redwood. Small quantities of other conifers and of hardwoods have been raised in the nursery.

The methods of seed collection, nursery practice, and field planting, although differing somewhat in detail from those of other regions, are sufficiently similar that they can be omitted from this paper. I might say, however, that, due to our favorable climatic conditions and the rapid development of redwood seedlings, these can be started in the spring and planted in the field the following winter. What I believe you are most interested in, however, is what we have accomplished and what conclusions we have drawn.

To assist in discussing the results I have prepared the tables on page 170.

From observations made during the yearly counts, losses of seedlings are attributed to the following:

	Per cent
Poor Stock and Poor Planting.....	10
Rodents	10
Grazing Animals.....	20
Soil, Site, Drought.....	25
Root Competition and Shading.....	35

In designating some stock as poor I do not mean that the nursery personnel is at fault, but simply that a backward spring prevented starting the stock early enough for it to attain normal growth by the time the field planting season is on. Under poor stock is also included stock which accumulates at the planting site because of slow planting and thus loses some of its vitality before

the planters get to it. Poor planting is the result of carelessness on the part of the planters and lack of intensive care only 25,000 seedlings a year it can give more care to each tree and as a result its planting gives a higher per cent of sur-

TABLE 1
PRODUCTION OF SCOTIA NURSERY

	1923	1924	1925	1926	1927	1928
No. of trees.....	41,356	790,571	1,082,998	2,291,718	807,540	1,500,000 ²
Per cent redwood.....	99	85	63	77	76	85 ²
Per cent 1-0 stock.....	96	100	95	98	98	100

² Estimated.

TABLE 2
PLANTING RECORD

	1922-23	1923-24	1924-25	1925-26	1926-27	1927-28	1928-29
Area in acres.....	5	67	1986	2433	4375	1616.5	2000 ³
No. of trees.....	2500	39,992	654,550	963,950	2,244,850	798,995	1,000,000 ³
Precipitation in per cent of normal (39.76 in.) .....	...	...	102	67	128	77	...
Redwood is estimated to have comprised 75 per cent and 1-0 seedlings 86 per cent of the stock used.							

³ Estimated.

TABLE 3
SURVIVAL RECORD

Species	Year planted	Survival per cent			
		1925	1926	1927	1928
Redwood	Prior to 1925	81	47	44	47 ⁴
	1925-26	..	54	39	40
	1926-27	..	..	48	48
	1927-28	..	..	..	69
Port Orford Cedar.....	Prior to 1925	100	80	77	71
	1925-26	..	67	64	58
	1926-27	..	..	63	60
	1927-28	..	..	..	80
Sitka Spruce	Prior to 1925	73	36	34	34
	1925-26	..	67	31	30
	1926-27	..	..	43	41
	1927-28	..	..	..	56
Douglas Fir	Prior to 1925	76	64	58	58
	1925-26	..	73	35	30
	1926-27	..	..	47	41
	1927-28	..	..	..	67

⁴ Trees listed as doubtful or dead have resprouted and are now listed as living.

in planting because of the large scale of the planting job. Hard soil is also a contributing factor. It has been demonstrated that where one company plants

vival than a company planting 200,000 or more a year.

Up until a year ago the major part of the planting has been done on areas

that had been logged eight or more years previously. These areas are more heavily infested with rodents than are the areas freshly logged. The young redwoods and Douglas firs are nipped by the rodents, sometimes only at the tips but more often at the ground line. Regardless of where they are attacked they usually die from the injuries, since the newly set out trees have little root vitality to overcome the damage.

Grazing animals, principally cattle, are charged with one-fifth of the loss. Although the animals do not, in most cases, intentionally graze the young seedlings, they do pull them up or trample them in runways and on soft ground. If we expect to grow trees successfully a policy must be adopted whereby planted areas are withheld from grazing during the first few years that the young seedlings are making their struggle for survival.

With reference to rodent damage, I stated that until a year ago the plantations were established on old logging works. Many of these areas were seeded to grass after logging was completed. This growth of grass and weeds, as well as small shrubs, makes a fairly solid mat of roots interlacing the soil. Although this growth shades the ground and thus conserves moisture, at the same time I think the moisture conserved is more than used up by the shading plants. It is also naturally harder to open a hole for planting a seedling in soil so interlaced with roots. That this has its effect has been shown by the company planting but 25,000 seedlings per year. In making its plantings during the past season, each spot was cleared of matted roots for approximately one foot in diameter before setting the seedling, with

the result that the survival record was better and the stem and foliage of the young seedling looked hardier and showed more growth for the first season, than previous plantings. Some plots have been planted in spots shaded by alder or myrtle brush with resulting lower survival.

Areas of rocky soil, which originally had not borne a heavy stand of timber, were planted with more or less negative survival results. In comparing the survival of the four species planted, one would assume that Port Orford cedar has shown itself superior to redwood. It must be considered, however, that the cedar was planted more carefully as to natural site than was the redwood. Since so great a percentage of redwood is used it is necessary at times to plant it on open, dry exposures, to which it does not naturally adapt itself and as a result the percentage of survival is lowered. The cedar seems to be more immune from rodent attack than some of the other species, due probably to its pungent odor and taste. Again, the cedar has in most cases had the advantage of an additional year in the nursery. An interesting observation in connection with site is that Sitka spruce planted on non-spruce sites, has grown better and shown survival results equal to or better than Douglas fir planted on what we have heretofore considered ideal fir sites. By comparing the years of planting as to survival and rainfall during the year of planting, we see that our 1928 count shows a lower survival for the year 1925-26 which was also a year of below-normal rainfall. Assuming that plantings made in years of lower rainfall will net a lower survival, we can expect that the

1927-28 plantings will show a lower survival at the end of the second and third years, than those of the 1926-27 season. Drought plays a very important part in the rôle of survival in this region. Although the region has a yearly rainfall in excess of most regions being reforested, nevertheless it all comes in a comparatively short period during the year. The rainy season starts from the middle of October or the first of November and continues through to about the middle of March. If the plantings are not completed by the first of February, the young seedling does not have time to adjust itself before the long dry summer arrives.

Another result noted from our observations is that from one to three years are required for the young seedling to adapt itself to its surroundings before it begins to make any appreciable growth. One area planted with redwood in 1924-25 just about held its own until this year, when it showed an average height growth for the season of 30 inches. From now on, one can expect a good growth each year on this area.

Still another assumption is that at the end of three years we have about reached the limit of loss excepting what

might occur from fire, slides, and mechanical damage.

In reviewing the results as shown by survival, one is apt to be discouraged by the showing, unless we consider the end toward which we are working. In making his recommendations for planting, Major Mason assumed that by planting the open spaces among the volunteer growth with seedlings placed eight feet apart we could suffer an approximate loss of fifty per cent of the planted stock and still have in the end a density of stocking that would produce an equal or greater footage per acre than is obtained from the present virgin stands. Our total survival has fallen short of this mark; however, we have been experimenting and are finding out wherein we are failing, and we should be able to improve the survival to a satisfactory point.

Assuming that by more careful planting on areas less infested with rodents and not already stocked with grass and weeds we can obtain a 50 per cent or better survival, and that our volunteer and planted stock will grow in volume as the samples shown by nature, we can estimate our ultimate results as follows:

	40 years	50 years	75 years	100 years
Cost of seedlings and planting at \$7.30 per acre.	\$75.09	\$134.47	\$577.12	\$2476.91
Annual taxes per acre, based on an assessed valuation of \$3.75 per acre and a tax rate of \$3.50 per \$100 of assessed valuation.....	20.13	38.11	170.75	740.04
Fire protection based on an assumed cost of 3 cents per acre per year.....	4.64	8.71	39.03	169.15
Sale value of land at the time of cutting at \$3.00 per acre	30.86	55.26	237.18	1017.64
Total	\$130.90	\$236.55	\$1024.08	\$4403.74

	40 years	50 years	75 years	100 years
Estimated net profit per acre per year for first ten years for grazing at \$0.27.....	\$27.97	\$50.09	\$214.99	\$922.72
Total cost less profit from grazing.....	\$101.93	\$186.46	\$809.09	\$3481.02
Average expected yield per acre in thousand board feet	53	76	93	115
Stumpage cost per thousand board feet.....	\$1.93	\$2.45	\$8.70	\$30.27

NOTE.—All charges and returns are carried forward at 6 per cent compound interest.

In setting forth these figures I have not taken into consideration the possibility of revenue from these reforested areas by one, two, or more thinnings. What, is asked, will the value be of the thinnings? The redwood may in time be very desirable for pole stock. The supply of western red cedar now being used is not inexhaustible. The redwood second growth makes a very good looking pole, and with a treatment of the sapwood this species should furnish a pole with a life equal or nearly equal to that of the cedar. The predicted use of redwood for pulp or rayon would also furnish a market for these thinnings. Thus we may expect that the estimated stumpage cost indicated above will be somewhat reduced; how much we cannot now tell.

The present stumpage price of virgin redwood is about \$2.50 per thousand board feet. Whether reforested areas will give us a reasonable rate of interest on the investment depends on the expected stumpage value of the future. If we can prove to the timber operator that he is going to receive this reasonable interest, he is sold to the idea of reforestation. Some operators can visualize the above high stumpage prices in the future and with that in mind are carrying on artificial planting. Other operators are not so optimistic and say "Why reforest on a gamble when nature will reforest

the cut-over lands herself if fire is kept out?"

We will grant that on the older cuttings nature has shown us that she will reforest naturally and give us a fully or almost fully stocked stand of second growth. We must consider, however, that these areas were logged years before the present logging equipment was used and as a result much of the young growth was not injured. In addition, much of the mature stand was left because of size or quality. With the present logging equipment, small growth and inferior timber is practically all destroyed. The system of clear cutting leaves little or nothing to be expected from natural reseeding and all we have to depend upon is the sprout growth. The entry of caterpillars in the redwoods may place the region on a logging system that will aid in natural reforestation. The results so far show this to be true, but never will the destruction of potential second growth be as little as it was in the early days. The present system of burning before logging is certainly not conducive to natural reforestation. If a system of disposal of logging debris can be worked out that will eliminate broadcast burning, we may further aid in natural regeneration. Until such a time as plans can be worked out to give nature full sway, it seems necessary for us at least to supplement nature to some

extent in her work to produce a fully stocked stand of second growth.

In order to secure cheaper methods in artificial reforestation, we have started experimental plots on which seed is sown in seed spots and by broadcasting. The initial step in this work was taken last spring. Areas were sown with seed of redwood, Douglas fir, Port Orford cedar, and Sitka spruce, using 1.3 pounds of seed per acre. These areas showed approximately a 10 per cent germination, but with the dry summer that followed this was reduced to a survival of two per cent. In my opinion, spring seeding does not conform to nature and I anticipate that the results of seeding done this fall will be more satisfactory. Seeding will require more seed over a given area than would be needed if sown in the nursery, but the elimination of nursery culture and field planting of seedlings will warrant a greater outlay in seed, providing we can secure the desired stand from this method and at the same time reduce the initial investment.

Logged areas adjacent to standing timber show natural seeding in sufficient quantity over an area reached by the prevailing winds. This area is so limited that one would have to leave seed trees fairly close together to obtain results from this method. The practicability of such a method is doubtful, since the present equipment and system of logging almost prohibit the leaving of seed trees. Were it possible to leave seed trees on an area it is doubtful if they would remain standing long enough to carry out their purpose, since the root system of the redwood is such that when left alone the tree is nearly always blown over.

There is little question that, if the redwood operators could be induced to adopt a system of selective cutting, we should have little to worry about in trying to maintain a perpetual supply of redwood timber. Much of our virgin redwood would respond most favorably to such a system, as there are many trees, roughly speaking those under four feet in diameter, which if relieved of the dominance of the old and mature trees, would increase their volume growth and perpetuate a seedling growth. Until there is a greater demand for the product, and utilization becomes more nearly what it should be, there is very little hope of converting the redwood operator to selective cutting.

There remains under present conditions only two means of supplementing the sprout and natural seedling growth to realize a perpetual timber supply in this region, namely, the planting of nursery stock or reseedling by the broadcast or seed spot methods, and the value of the latter has not been fully proved. Any one of the many ways suggested to secure natural regeneration may some time prove to be the solution of our reforestation problems, but until that time arrives we are planting artificially on the assumption that even our present methods do pay.

In recent years the public has come to look upon the timber operator as a destructive animal, conducting his operations to suit himself with no regard for the welfare of the community. Every action of the lumberman outside of his usual procedure is viewed with suspicion by the public. The adoption of a reforestation program and the support by the lumberman of the recently enacted

legislation in connection with reforestation, has been generally accepted by the public as a means of escaping taxes on the part of the timber owner. Herein the public is wrong, since those operators who have reforested cut-over lands pay just as much tax on the land reforested as heretofore. The land planted to trees yields the same tax as does the land not so planted. The only effect of the California legislative act was to assure the landowner that his crop would not be taxed for a period of forty years or the estimated time that this crop would need to grow before it had attained any real value. After that period the crop may be taxed, and then not only the operator will realize on his investment, but the community will benefit by taxation as well, and it has in addition an established industry operated on a permanent basis. The efforts of the lumber companies of Humboldt and Mendocino counties should be commended and every assistance should be given them in their pioneer work of reforestation.

Summarizing in brief: The Humboldt Redwood Reforestation Association was established to carry on scientific forestry in the redwood belt, in advance of com-

plete denudation of the area. Coöperation in fire protection and reforestation were the objectives. Considerable co-operation has been given the State Board of Forestry in fire protection. Coöperation has been given the Save The Redwoods League in preserving tracts of old growth redwood. Reforestation artificially has been practiced so that at the close of the present season nearly 12,500 acres have been reforested with approximately 5,500,000 seedlings. In Mendocino County this work has been about duplicated. Results of past plantings have proved that with care trees can be grown over a period of years with a resulting crop that can be reasonably expected to bring a fair return on the investment. Until such time as we modify our present logging methods we must use this system to reforest the cut-over areas if we expect to obtain a fully stocked stand. Whatever method we use, if we can obtain the results at no greater cost than we have at present demonstrated, I do not believe that we are overstepping good business judgment in saying that reforestation in the redwood belt does pay.

CHEMICAL ANALYSIS OF THE OLEORESINS AS A MEANS OF DISTINGUISHING JEFFREY PINE AND WESTERN YELLOW PINE

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THE taxonomic position of *Pinus jeffreyi* Balf., *P. jeffreyi* Murray, *P. jeffreyi* "Oreg. Com." (2, 7, 13, 15, 19, 27)¹ and its relation to

P. ponderosa Laws.² have long been subject to differences of opinion on the part of botanists. Recent experimental work by the writer afforded an opportunity to

¹Jeffrey pine was discovered in 1852 by John Jeffrey and was named by Professor Murray, the description being published by Professor Balfour in the "Report of the Oregon Committee." Since that time it has been variously described as a distinct species and as a variety of western yellow pine. Jepson (15) designates it *P. ponderosa* var. *jeffreyi* Vasey. Britton (7) describes it under the same name, though he remarks that this pine is "quite distinct (from *P. ponderosa*) and may perhaps be deserving of specific rank." Again Howell (13), Sudworth (27), and Abrams (2) consider it a distinct species.

One of the earliest and most observant students of Jeffrey pine, Professor J. G. Lemmon (19), arrived at the conclusion that Jeffrey pine, which had all along been called a variety of *ponderosa*, should be accorded the rank of a distinct species. Besides the typical Jeffrey pine (of Jeffrey's discovery) Lemmon detected three "marked forms," namely: (1) *ambigua*, (2) *peninsularis*, and (3) *deflexa*. His variety "ambigua," given as occurring in Montana, apparently was based only on a form described by Sargent as occurring in that State and referred to by Sargent as western yellow pine. So far as is known to the writer there is no indication in later literature that Jeffrey pine occurs in Montana. Specimens of foliage and cones recently sent to the writer from the locality mentioned by Lemmon seem unquestionably to be western yellow pine. There is, therefore, much doubt whether Lemmon's variety "ambigua" can be referred at all to Jeffrey pine. The variety "peninsularis" was found

by Lemmon "on the peninsula of Lower California on the San Raphael Mountains at an elevation" (quite unusual for this species in such a low latitude) "of about 4000 feet. It forms an extensive forest upon loose débris of white granite." According to Lemmon, the bark of this variety is grayish or darker, deeply furrowed; cones remarkably abundant, 6 to 8 inches long, scales large with strong umbos and thick, firmly deflexed prickles. The variety "deflexa" (*P. deflexa* Torrey) is common in the higher Sierra in California. The bark is reddish brown, thick, and coarsely checked by wavy lines; leaves glaucous.

²Among the four varieties of *P. ponderosa* mentioned by Lemmon, the variety *nigricans* (19, p. 198) is very interesting in connection with the present study. Lemmon describes it as a tree of medium size (120 to 150 feet) with the bark dark brown or almost black, hard, rather coarsely checked, whereas typical yellow pine has light yellow soft bark divided into large plates. He says: "This form is generally found in company with the larger, typical, whitish-barked trees, but in moister localities. It is particularly prevalent in small valleys and along the edges of forests in the Sierras. . . . This form has been confounded with forms of *Pinus jeffreyi*, but may always be distinguished by its lighter colored bark, its smaller and narrower cones, green until maturity, its leaves apple-green, never glaucous, and by its longer, narrower, reddish brown male blossoms; also, by its terebinthinous, not aromatic odors."

obtain some interesting material bearing on this relationship.

This study was made on behalf of the California Forest Experiment Station in the summer of 1927, chiefly in the Lassen National Forest, about 30 miles northeast of Lassen Peak. The experimental area was located on a gentle southerly exposure, the elevation ranging from 5700 to 6100 feet. The stand was composed of both Jeffrey and western yellow pines with predominance of the former. Scattered junipers occurred here and there in the stand. On the more rocky places specimens of *Cercocarpus ledifolius* appeared. The lower part of the area bordered on an extensive open flat, the fringes of which were covered with *Artemisia tridentata*. Herbaceous vegetation was represented by species of *Lupinus*, *Wyethia*, *Chrysothamnus*, and *Gramineæ*. These plants were rather scattered, never covering the ground completely. The soil is of volcanic origin, developed upon quaternary basaltic lava, well decomposed and relatively fresh. The physical conditions of this area seem to be in accordance with Lemmon's suggestion that typical Jeffrey pine occurs on "those slopes which were first left bare by the withdrawal of the ice at the close of the Glacial Epoch."

Typical forms of both Jeffrey and western yellow pine were present and little difficulty was experienced in distinguishing between them. The Jeffrey pine has characteristically dark brown to cinnamon-red bark, irregularly furrowed, the cones being 5 to 6 inches long, shaped like an "old-fashioned straw beehive" (17). The western yellow pine has, when mature, dull, light yellowish bark

with large, squarish flat plates, and small cones 2 to 3 inches in length.

Cones of typical trees of these two species exhibit quite pronounced differences, not only in size, but in scale arrangement and shape of prickles. The scales of Jeffrey pine are more numerous, projecting almost horizontally from the axis of the cone, and are armed with long, deflexed prickles (Figure 1, 1-4). The cone scales of western yellow pine are fewer in number, more irregularly spreading from the cone axis, with short, erect prickles (Figure 1, 9-11.)

Lamb (18), upon observations in the field and in the large herbaria of the United States, considers the difference in shape of cone scale as a very consistent means of distinguishing between the two species. According to this author, the cones of yellow pine have scales with short, broad prickles which are erect, as the drawing attached to his report shows. The cones of Jeffrey pine have slender down-curved prickles.

Figure 1, 1-8, shows variations in the cone scale shape as observed by the writer in the field. It is evident that the use of this character as a basis for distinction in the case of non-typical forms would lead to confusion. Lemmon (19) in his diagnoses always describes the shape of western yellow pine prickles as being erect or incurved. As a rule, on the present experimental area, Jeffrey pine has prickles either deflexed or, rarely, hooked backward. In only one case, near Westwood Junction, were cones of this species found armed with erect short prickles (Figure 1, 7-8). This may be assignable to individual variation.

There are indications (9) of consistent differences between the buds of these

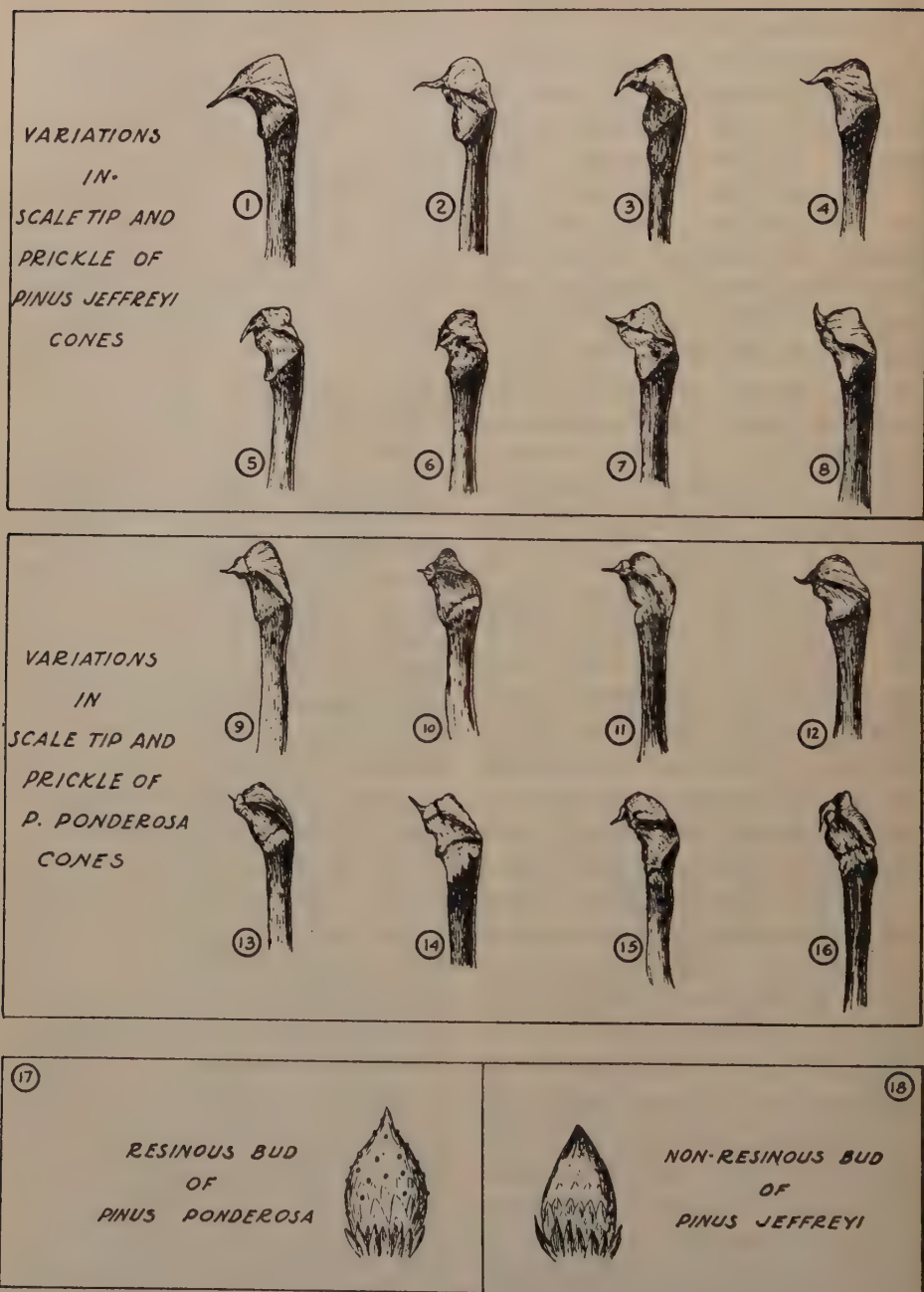


FIG. 1. Variations in scale tip and prickles in Jeffrey pine and western yellow pine, and differences between the two species in bud form.

two species of "broken-cone pines."³ The buds of Jeffrey pine are non-resinous while those of yellow pine are covered with numerous resin droplets. (Figure 1, 17-18.) This character has been checked for many specimens and has proved to be constant, at least for the places where these pines have been studied in California. It is noted, however, that in specimens of western yellow pine foliage recently received from Montana, as above referred to, the buds are not resinous.

The bark of Jeffrey pine varies very much in its texture and color. Sometimes it is lighter than that of non-typical yellow pine (compare var. *nigricans* Lem.). The main differences in the bark of the two species, based on examination of hundreds of trees in the field, appear to be as follows: In Jeffrey pine, the color of newly exposed inner bark scales varies from grayish to brownish tan; in western yellow pine these scales are consistently light yellow, appearing as if powdered with sulphur (16, p. 40, 19, p. 197). This distinction is nearly constant for both typical and non-typical trees. It is of interest to note that the scolytid beetle, *Dendroctonus jeffreyi* Hopkins (12), apparently makes a sharp distinction between Jeffrey pine and western yellow pine. This *Dendroctonus* often attacks Jeffrey pine but very seldom, if ever, attacks western yellow pine. The writer has never found it attacking the latter, although Hopkins states that it sometimes does so.

Differences between Jeffrey pine and western yellow pine are very clearly dis-

tinguishable in the juvenile stage, in which intermediate forms are not yet apparent. Young western yellow pines are distinguished by buds which are always resinous, by the young brownish-green branchlets "shining as if varnished" (19). The bark of the upper part of the stem and smaller branches is grayish, marked by rather coarse yellow-brown longitudinal fissures. The foliage is bright green in color. Young Jeffrey pines have non-resinous buds somewhat different in shape (Figure 1, 17-18), the branchlets are pruinose, and the bark of the upper stem is smooth and light gray in color with a somewhat purplish hue, resembling the bark of young firs. The leaves are bluish green, contrasting very distinctly with the yellowish green ones of the western yellow pine.

According to G. R. Shaw (25) the pruinose branchlets of Jeffrey pine are associated rather with a dry environment than with a species. This statement does not seem to be in accordance with present field observations, since the pronounced differences in the branchlets were found between *jeffreyi* and *ponderosa* growing side by side under the same environmental conditions. The writer has found the bark of young Jeffrey pines, before it becomes fissured with age, to be marked uniformly by numerous resin-filled pustules, like the bark of fir. These pustules have never been found by the writer on the bark of western yellow pines.

Besides the morphological differences between *P. jeffreyi* and *P. ponderosa*, a marked distinction is found in the leaf anatomy of these species. As shown by Figure 2, *P. ponderosa* needles have a single row of thin-walled cells between the epidermis and the cortical heavy-walled sclerenchyma cells; *P. jeffreyi*

³The fracturing of cone base is common for western yellow pine as well as for Jeffrey pine, undeveloped basal scales persisting on the limb.

*INTERNAL STRUCTURE OF LEAVES OF
JEFFREY PINE AND WESTERN YELLOW PINE*

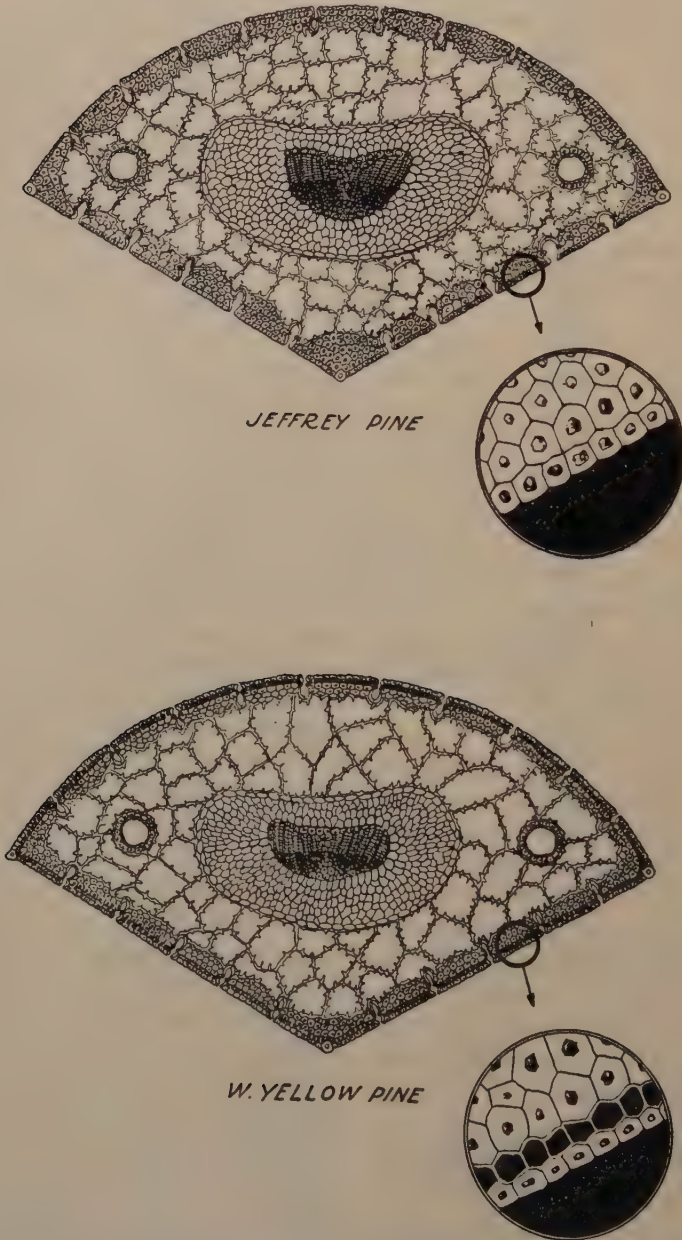


FIG. 2. Internal structure of leaves of Jeffrey pine and western yellow pine.

needles have no thin-walled cells in the cortical region, strengthening tissue being just beneath the epidermis. It should be noted that the cells above called thin-walled are hardly so in the sense in which parenchymatous structures such as internal mesophyll may be thin-walled; but they are strikingly thinner walled than the epidermal and strengthening cells adjacent to them. Coulter and Rose (8) found no difficulty in distinguishing this thin-walled layer in the pines under consideration and they suggested that this character is of considerable importance. This was verified by Lamb (18) and has been checked for a larger number of specimens by the writer. Various investigators have indicated a significant difference in the number of cotyledons of Jeffrey pine and western yellow pine (27). The writer has failed to find any significant difference in this character, the number of cotyledons for both pines appearing to vary usually from 8 to 12, the most common number being ten.

It should be expected that the geological record would throw considerable light on the problem of taxonomic relation, but the hope is in this case vain. Professor Lemmon stated that Jeffrey pine was not only an older form than *ponderosa* but should be considered the ancestor of this comparatively younger species. What his basis for such a statement was can only be conjectured. The writer understands from paleobotanists that, while fossil three-leaved pine material occurs as far back as possibly the Jurassic, there is none of it which has been definitely assigned to either of the species under consideration. These species, in short, may be said to have practically no fossil record.

It is not understood, however, that paleobotanists have ever attempted the application to this purpose of the differences in leaf anatomy first called to attention by Coulter (8). It is suggested that in so doing there may be possibilities of carrying one or both of these species back into the record of that geological past in which they must have been represented.

Non-typical forms (past the juvenile stage) displayed such variations in appearance that frequently very close inspection was necessary to determine definitely whether *ponderosa* or *jeffreyi* was represented. Careful study confirmed the conclusion of C. S. Smith (26) and others that few of the intermediate forms are referable to *P. jeffreyi*, while those of *P. ponderosa* were found in abundance. In fact, when an attempt was made to establish five groups of trees (and to select five specimens of each) showing five morphological gradations between typical *jeffreyi* and typical *ponderosa*, abundant non-typical yellow pines were found without difficulty, but only four such specimens of Jeffrey pine (out of hundreds) could be selected. Three of these individuals had been selected on account of their rather light reddish bark and some variations in the shape of prickles, as shown in Figure 1, 4-6, (var. *deflexa?*), the other because of its soft bark, with yellowish newly exposed flakes and prickles characteristic of Jeffrey pine. All these pines were found to be heptane-producing trees, and were, therefore, classified as Jeffrey pine forms, on the strength of the apparent determinative significance of this character, discussed below.

The distinction between Jeffrey pine and non-typical forms of western yellow

pine by means of morphological characters is not easy. Nevertheless, experience indicates that by close study one can nearly always find some constant morphological characteristics present. If the cones are not typical, the appearance of the outer bark or the color of the newly exposed bark layers may help in identification. Only one specimen among many examined might have been taken for *jeffreyi*, on the basis of the size of the cones (5 inches) and the rather hard dark bark with inner flakes not of the prominent sulphur-yellow color characteristic of *ponderosa*; but it was nevertheless clearly indicated to be *ponderosa* by the terebinthinous odor of the oleoresin (obtained by boring with a knife through the bark to the cambium).

The validity of this odor as a diagnostic character, conclusive especially as a last resort, rests upon differences in the chemical composition of their oleoresins that appear to be completely constant, at least in the area studied. The chemical peculiarities of Jeffrey pine, indeed, are so important that they should be given special consideration.

The oleoresin formed in the wood of *P. jeffreyi* contains an aliphatic hydrocarbon, normal heptane (C_7H_{16}), and none whatever of the mixture of terpenes ($C_{10}H_{18}$) usually found in pines. Only two plant species besides Jeffrey pine are thus far known to contain heptane—*P. sabiniana* (22), also a California pine, and *Pittosporum resiniferum* (3), a tree of the Philippines.

The occurrence of a hydrocarbon of the methane series in the oleoresins of California pines was first reported by Professor Wenzell (28) in 1872, to the great surprise of chemists, and caused an extensive discussion (24) lasting as late

as 1899. Gildemeister and Hoffman (11) suggested that probably Wenzell's abietine (heptane) was simply a petroleum fraction. Until 1904, the botanical source of abietine was an open question (29).

In 1913, oleoresin samples of Jeffrey pine were analyzed by Schorger (22). Two years later Adams (1) tested a sample of oil obtained by steam distillation of wood from an authoritatively identified Jeffrey pine. Both authors found that the bulk of the oil consisted of *n*-heptane. The occurrence of heptane in Jeffrey pine is, therefore, a well-established fact.

The composition of the oleoresin of Jeffrey pine appears to be as follows: The volatile part consist of *n*-heptane (about 95 per cent) and small amounts of *n*-decyclic aldehyde, linalool, and methylchavicol (21). The non-volatile part (rosin) consists of 12.5 per cent resene, the balance being mainly abietic acid.

It is of interest to note that the oil from the twigs and needles of *Pinus sabiniana* consists of terpenes (14) and that the fruits (nuts) of *Pittosporum* contain both a dihydroterpene ($C_{10}H_{18}$) and *n*-heptane.

Both the writer and Dr. Eloise Gerry of the Forest Products Laboratory of the U. S. Forest Service have found that the bark of Jeffrey pine contains resin ducts as well as the resin pockets already referred to, and that both appear to have a direct relation to the oil also found in the bark. Since the oil from the bark of Jeffrey pine had not previously been examined, the writer distilled samples of the bark of young trees. Specimens were selected which exhibited typical morphological characteristics of *Pinus jeffreyi* and contained heptane in the wood. Care

was exercised to prevent any woody parts being distilled, in order to avoid confusion with the wood oleoresin as happened in the twig distillation of Digger pine as reported by Schorger (22).

A small sample (30 g.) of oil obtained by steam distillation of the twig and upper stem bark was examined. The fractions were separated at each 10° decade point after boiling commenced, which was premised on the boiling point of α -pinene at 156° C. and that of β -pinene at 163° C., so as to separate out these two possible constituents. The following table shows the constants of this oil, with Schorger's (22) data for western yellow pine and Digger pine for comparison:

Constants	Jeffrey pine	Western yellow pine	Digger pine
Specific gravity at 15° C....	0.8659	0.8718-0.8849	0.8517-0.8566
Optical rotation at 20° C. in a 100-mm. tube.....	-25.86	(-15.73)-(-19.59)	(-20.93)-(-38.36)
Index refraction	1.4715	1.4789-1.4815	1.4670-1.4708

The oil was submitted to fractional distillation with the following results:

Number of fractions	Temperature ° C.	Distillate observed Per cent	Distillate cumulative Per cent	Index of refraction 20° C.
1.....	150-160 ^a	32	32	1.4630
2.....	160-170 ^b	40	72	1.4685
3.....	170-180	6	78	1.4710
4.....	180-220	11	89	1.4743
Residue		9		1.4880
Losses		2		

^a Mainly 155.

^b Mainly 165.

On the suggestion of Professor W. H. Dore of the Laboratory of Agricultural Chemistry, University of California, where, by his courtesy, the distillation was carried out, each fraction was tested by means of Schiff's reagent for the possible presence of furfural. The aqueous extract gave a deep violet color instead of the rose color usual for furfural. The violet color was especially strong in frac-

tion 3. What this reaction is due to has not thus far been determined.

Owing to the small amount of oil, no more definite information could be obtained. Nevertheless, this rather incomplete test seems to be of a considerable importance. It shows that the composition of Jeffrey pine bark oil is entirely different from that of oil obtained from wood of this species. As the oil started to boil at 155° C. it is safe to conclude that *n*-heptane (boiling point 98° C.) is absent. Judging from the boiling points and physical constants of Jeffrey pine bark oil, it appears that this oil consists, as usual for the genus *Pinus*, of terpenes with the possible presence of esters. It

is of interest to note that more than 70 per cent of oil distilled between 155°

and 165° C. It appears, therefore, that probably pinene (α and β) is the chief constituent of this oil. It would be highly desirable to collect a greater amount of the oil for further investigation. From field experience it appears that the oil present in needles and cones of Jeffrey pine also contains no heptane, but consists of terpenes.

The chemical composition of the oleo-

resin of western yellow pine has been determined by Schorger (22). The volatile oil contains 5 per cent α -pinene, 60 per cent β -pinene, 20 per cent limonene, and 10 per cent sesquiterpene (cadiene). The rosin contains about 90 per cent abietic acid.

The difference, therefore, in the composition of the oils of the two species under consideration is beyond doubt. It remains to be seen whether these chemical differences throw any light upon the taxonomic relations between *ponderosa* and *jeffreyi*. It must be emphasized at the beginning that the conclusiveness of the presence of heptane or terpenes, respectively, with respect to the identity of the specimen as *P. jeffreyi* or *P. ponderosa* says nothing respecting the rank of either of these forms in the taxonomic scheme or, in other words, whether the former is entitled to that specific name or should have a varietal cognomen added to it. Lemmon in his descriptions always mentions differences in odor between the two species (due to the different chemical composition).

Mueller in this *Eucalyptographia* (20), describing *Eucalyptus piperida*, states that the chemical peculiarities of the bark and wood may possibly be used to distinguish this species from *E. obliqua*. Some authorities consider differences in chemical composition insufficient grounds for the taxonomic separation of forms. In 1914 Lamb (18) pointed out that "such methods can not contribute greatly to the distinction of species." Twelve years before this statement was made, an excellent work on Australian eucalypts (4) appeared in print, whose authors "adopted a system of classification based not on morphological characters of dried material alone, but on (1) a field knowl-

edge of the trees; (2) the nature and character of their bark and their timber; (3) the morphology of their fruits, leaves, buds, etc.; and (4) the chemical properties and physical characters of the oils and the utilization of any other evidence such as histology." For any given species they found a well-determined constancy in the chemical composition of the oil.

In other works (5, 6) Baker and Smith point out that "a remarkable constancy is found in the chemical constituents of the oil of any particular species wherever grown" and that the constancy in the chemical composition of the same species is of great value in the distinction between the several species. These authors concluded that the chemical composition may safely be used for distinction between species, especially when the morphological characteristics are not clear enough. Finnemore (10) in his recent book says that "this method may be of interest in the study of other volatile oils but it must be used with caution" outside of Australia as that continent represents a flora which has been established a relatively long time. Schorger (23) found that there is a chemical constancy for *P. ponderosa* var. *scopulorum* from different places. Again, typical yellow pine has the same chemical constancy either in Washington or in California.

One of the most uncompromising views against the validity of chemical composition as a basis of taxonomic diagnosis, recently expressed verbally to the writer by a very eminent American botanist, rests upon the ease with which artificially produced varieties of plants can be changed in their chemical characters. Apparently, however, this might be admitted without its proving that chemi-

cal composition was thus unstable under natural processes. That changes in chemical composition have occurred in the evolutionary process seems inevitable in view of differences in this respect between genera, and even species, of undoubted common origin. But the causes of such changes, the extent to which they accompany smaller steps in the evolutionary process, and thus the limits within which chemical differences may be diagnostic in respect to natural botanical forms, would seem to be questions of fact, to be determined upon the evidence.

Of interest is Schorger's observation that the oils of non-typical yellow pines (so-called cross varieties) are not so constant as those of typical forms, though very closely related to them, being composed of terpenes. It is the writer's opinion that differences in oils of different forms of yellow pine by no means indicate intercrossing between this species and Jeffrey pine, but represent merely variations within the limits of the *ponderosa* group. Jeffrey pine does not display such variation, the chemical composition of the oil being rather constant.

This is in accordance with the morphological variations of yellow and Jeffrey pines, based on the writer's field experience. During the field work the question was often raised as to the possible intermixture of heptane and terpenes in the oleoresin of non-typical or intermediate pines (so-called hybrids) because of a yellow color or an apparently unusual, penetrating odor in the oleoresin. As this was a question of practical importance in the tapping of the trees, several samples of the "hybrid" oleoresins were examined without delay.

The field test consisted of the distillation of the oleoresin with steam. The

volatile oil was then redistilled, with thermometer control, over direct flame. About 95 per cent of the oil distilled below 100° C. (heptane), all of the remainder (a yellowish oil) having a boiling point about 200° C. No ingredients were found having boiling points corresponding to those of terpenes, or lying anywhere between the points named. In all ten cases considerable constancy was observed in the amount of heptane present. The morphological characters of these "hybrids" were found to be typical of *jeffreyi*. In 1912, when the turpentine possibilities of the Pacific Coast were being studied, the same question arose as to intermediate forms between Jeffrey and yellow pines. At that time all "cross varieties" selected were found to be turpentine-producing trees, and the conclusion was reached (26) that "unless a pine is typically Jeffrey it must be considered western yellow." In other words, all cross varieties have thus far been found within the limits of the *ponderosa* group.⁴

So far as is known to the writer there are no direct statements in the special literature in regard to the possibility of natural hybridization between *P. jeffreyi* and *P. ponderosa*. The general opinion

⁴ Since the above text was written, chemical analysis of the oleoresin from one specific experimental tree, made by the Forest Products Laboratory, has shown a mixture of approximately 10 per cent heptane and 90 per cent terpenes. In this tree the cones and bark scales were typical of Jeffrey pine but the buds were resinous as in western yellow pine. This mixture has not otherwise been found and has not been verified as yet by further samples from the tree concerned. The fact, if verified, will have a considerable bearing upon the statements of this paper regarding hybridization.

of local people is rather strongly in favor of the occurrence of intercrossing of the two. This notion is based mainly on the difficulties of field distinction between the two species. The question has not been scientifically studied thus far. Fortunately definite experiments in controlled crossing of these species are an early possibility. Observation during the tapping experiments of the Forest Service (in 1912 and 1927) gave uniformly negative results. In forest planting, also, the writer is informed, forest-grown Jeffrey pine seed invariably results in typical Jeffrey seedlings, or seedlings at any rate in which divergence from typical form is indistinguishable. If hybridization occurred, there should be expected a proportion of clearly non-typical forms. It is worth while referring again to Baker's and Smith's suggestion that "very definite knowledge is needed before one can accept the statement that such and such a tree is a hybrid under natural conditions."

In the foregoing discussion it is attempted to show, summarizing broadly:

1. That there are numerous morphological diagnostic characters common to *P. jeffreyi* and *P. ponderosa* which make it reasonably easy to distinguish specimens typical of either.

2. That in non-typical trees, which are numerous, variation may be so great in practically all the morphological characters as to overlap widely, and thus to obscure the relation.

3. That these non-typical forms are shown to be referable mostly to *P. ponderosa*, by practically the only diagnostic character as between these species which the work discussed has shown to be constant and stable, namely, the chemical composition of the oleoresins.

4. That while the validity of chemical composition as a basis of species diagnosis is strenuously objected to by some botanists, it has also had some able defenders; but no one seems to have done conclusive investigative work upon it.

All but the fourth point concern facts, established by various investigators. The question regarding the validity of this diagnosis is submitted to botanists as a subject promising considerable value for taxonomics in return for the labor of submitting it to statistical study as a matter of equally determinable fact. It should not be discarded merely on *a priori* grounds or those of analogy.

REFERENCES

1. Adams, M. 1915. Composition of Wood Turpentine. Jour. of Indus. Engin. Chem. 7: 957-960.
2. Abrams, L. R. 1923. An Illustrated Flora of the Pacific States. 1, 557 p. Stanford University.
3. Bacon, R. F. 1909. The Philippine Terpenes and Essential Oils, III. Philippine Jour. Sci. Sec. A. 4: 93-132.
4. Baker, R. T., and Smith, H. G. 1920. A Research on the Eucalypts, Especially in Regard to Their Essential Oils. Tech. Ed., Ser. 24. 471 p., illus. Sydney.
5. ———. 1901. On the Relation Between Leaf Venation and the Presence of Certain Chemical Constituents in the Oil of Eucalypts. Jour. and Proc. Roy. Soc. of New South Wales. 35: 121.
6. ———. 1910. A Research on the Pines of Australia. Tech. Ed., Ser. 16, 458 p., illus. Sydney.
7. Britton, N. L. 1908. North American Trees. 894 p., illus. New York.
8. Coulter, J. M., and Rose, J. N. 1886. Synopsis of North American Pines, Based Upon Leaf Anatomy. Bot. Gaz. XI: 256-262, 302-309.
9. Dallimore, W., and Jackson, A. B. 1923. A Handbook of Coniferae Including Ginkgoaceae. 570 p., illus. London and New York.

10. Finnemore, H. 1926. *The Essential Oils*. 880 p. London.
11. Gildemeister, E., and Hoffman, F. 1899. *Die Ätherischen Öle*. Berlin.
12. Hopkins, A. D. 1909. *Practical Information on the Scolytid Beetles of North American Forests*. 1. *Bark Beetles of the Genus Dendroctonus*. U. S. Dept. Agr., Bur. Ent. Bul. 83. 169 p., illus.
13. Howell, T. 1897-1903. *Flora of Northwest America; Containing Brief Descriptions of All the Known Indigenous and Naturalized Plants Growing Without Cultivation North of California, West of Utah and South of British Columbia*. 1. 792 p. Portland.
14. Jepson, W. L. 1910. *The Silva of California*. 480 p., illus. Berkeley.
15. ———. 1925. *A Manual of the Flowering Plants of California*. 1238 p., illus. Berkeley.
16. ———. 1923. *The Trees of California*. 240 p., illus. Berkeley.
17. Kellogg, A. 1880-1882. *The Forest Trees of California*. Calif. State Min., 2d Rpt., App. 1-116.
18. Lamb, W. H. 1914. *Discussion of Turpentine Possibilities on the Pacific Coast*. Soc. Amer. Foresters, 9: 338-341, illus.
19. Lemmon, J. G. 1889-1890. *Revision of Broken Cone Pines*. Calif. State Bd. Forestry 3d Bien. Rpt. 196-201, illus.
20. Mueller, F. von. 1879-84. *Eucalyptographia*. Melbourne.
21. Schimmel and Co. 1914-1915. *On Essential Oils, Synthetic Perfumes*. Semi-Rpt. 110 p. London-New York.
22. Schorger, A. W. 1919. *Contribution to the Chemistry of American Conifers*. Wis. Acad. Sci., Arts, and Letters, Trans. 19, Pt. 2: 728-766.
23. ———. 1916. *Chemistry as an Aid in the Identification of Species*. Soc. Amer. Foresters, II: 33-39.
24. ———. 1913. *An Examination of the Oleoresins of Some Western Pines*. U. S. Dept. Agr., Forest Service Bul. 119, 36 p., illus.
25. Shaw, G. R. 1914. *The Genus Pinus*. Pubs. Arnold Arboretum No. 5, 96 p., illus.
26. Smith, C. S. 1914. *Turpentine Possibilities on the Pacific Coast*. Soc. Amer. Foresters, 9: 327-338.
27. Sudworth, G. B. 1908. *Forest Trees of the Pacific Slope*. U. S. Dept. Agr. Forest Service, unnumbered Bul., 441 p., illus.
28. Wenzell, W. T. 1872. *Abietine, a new Hydrocarbon*. Amer. Jour. Pharm., March, 97-100.
29. ———. 1904. *On Abietine*. Pharm. Rev. 22: 408-414, illus.

REVIEWS

Hunger Fighters. By Paul de Kruif.
Pp. 376. Harcourt, Brace and Company, New York. 1928.

The literature devoted to popularization or, as Robinson would put it, humanization of science has been enriched within the last few years by several notable contributions—Will Durant's "Story of Philosophy," "Microbe Hunters" by de Kruif, and more recently "Hunger Fighters," also by de Kruif. Popularization of science has been left too much to newspaper men who often, without fully realizing the significance of the discovery, dramatize the non-essential things and throw a cloak of mystery over the work of the scientist.

Until the appearance of "Arrow-smith," by Sinclair Lewis, the scientist of fiction was either a freak, or a man of extraordinary attainments—a man of mystery, a magician, a wizard. Dr. Arrowsmith, for the first time in our American literature, is depicted as a realistic chap, heir to all the human weaknesses, and not unlike any ordinary mortal. How much Dr. de Kruif helped Sinclair Lewis in making the hero of his book a realistic person, we don't know. In the light of de Kruif's *Microbe Hunters* and his *Hunger Fighters*, we should judge, this influence was not small.

Another direction of science popularization in this country has been towards sentimentalism, mostly by women writ-

ers, on the beauties of flowers, the wonders of nature, and so on.

In Europe the best popularizers of science are the scientists themselves—men like the great physicists Tyndall, Huxley, Haeckel, and a host of others. The clearest and simplest presentation of the theory of evolution is found in Darwin's own two volumes, "The Origin of Species." Our scientists for some reason have considered it beneath their dignity to write about their findings in a style that would interest the average reader. Books, therefore, like "Hunger Fighters," by Dr. Paul de Kruif, himself a scientist, mark a new departure in our efforts to popularize science and, we hope, may find a number of followers among his colleagues.

"Hunger Fighters" should be of particular interest to foresters and conservationists of every type. What is "Hunger Fighters," if not a book on conservation? Is making wheat grow on millions of acres, where its culture was precarious, not conservation? Is saving our "meat on four legs" from the blasting effect of foot and mouth disease and hog cholera not conservation? Or, what is increasing many-fold the yields of corn by crossing, or saving human life by finding balanced diets, but conservation in the truest sense of the word?

The book is not merely a story of the scientific discoveries that led to increasing the North American food supply. It is also a series of intimate biographies of

a few men, who through their work contributed immensely to the wealth and well-being of this country, yet who themselves remained in obscurity—biographies written, not without realization of the weaknesses of the men, yet sympathetically and understandingly.

I believe "Hunger Fighters" is a better book even than "Microbe Hunters." This is only natural. The men whom de Kruif describes in "Hunger Fighters" are practically all men of his own generation, many of whom are still living and whom de Kruif apparently knew personally or whose friends are still living and therefore could furnish that realistic touch that comes from first hand personal knowledge. On the other hand, most of the men who figure in "Microbe Hunters" belong already to history, and their deeds and personal traits had to be largely reconstructed from tradition, biographies, or other historic documents.

De Kruif is not given to hero worship of the hunger fighters. He knows them too well and too intimately for that—he knows their weaknesses, their blunders, but also their humility, their single-mindedness, and their strivings. Again and again he emphasizes that they are not Olympians but just ordinary folks. To prove his point he at times goes out of his way and exaggerates a bit their human faults. Before your eyes pass a number of ordinary men, often erring just as any other ordinary men do, often illogical in their conclusions, and stumbling *accidentally* on great discoveries. What distinguishes them from ordinary men is an obsession, an intense urge to rid a community of some disease, or to increase man's power over nature in the struggle for a better living. It is this

urge that helps them to overcome handicaps, their own shortcomings, their own blunders, and turns an accidental observation into a really great finding.

It is no "romantic clap-trap" to try to trace this urge to the early experience of the men. If it were not so, then why should it be Carleton, a boy grown up on a wheat farm in the stern climate of central Kansas, who became the wheat dreamer and wandered to distant corners of Siberia in search of hardy varieties? Why should it be Goldberger, a starving boy from the "sidewalks of New York," who stumbled on the true cause of pellagra, a deficiency in human food?

Although the book consists of biographies of ten men, it really deals with four fields of human endeavor: developing varieties of wheat suitable to adverse climates, protecting the meat supply from destructive diseases, raising more plentiful and better crops of corn, and finally discovering deficiencies in human diets which permit people to starve to death in the face of plenty.

"Hunger Fighters," although not a scientific treatise, will be of great help to science in general. De Kruif has done what thousands of official scientific publications and arguments before congressional committees on appropriations usually fail to do—to point out the tremendous social value of science. Convincingly and dramatically, he shows how scientific research enters into the life of the community, and how intimately it affects the sufferings, struggles, well-being, and happiness of the people. It should also be a great stimulus to the research men themselves, and especially to the youngest of the scientific workers—the foresters. What higher aspiration can they have than to emulate in their

own field what the hunger fighters have done in the field of scientific agriculture?

RAPHAEL ZON.



The Practice of Silviculture. By Ralph C. Hawley, Professor of Forestry, Yale School of Forestry, New Haven, Conn. *Second Edition, Rewritten and Reset. Pp. 335, 1929. John Wiley & Sons, Inc., New York. \$4.00.*

In this country we are just beginning to understand that the underlying idea of forestry is the production of wood crops. To handle forests as a growing crop is a new idea, where wood has been so abundant up to now. It means that we must learn to apply to our accustomed methods of harvesting our forest crops theories and practices which, though they are new to us in the United States of America, are well known and successfully used in other countries where economic necessity has already forced their application. These practices must rest on a scientifically sound foundation, and their application in this country, with whatever variations local conditions may necessitate, will be in accordance with a general scheme or system of standards already worked out and successfully applied where silviculture has been practiced for many generations.

Ever since the publication of Hawley's "Practice of Silviculture" in 1921, it has held the first place as an authoritative source of information on the subject of silvicultural practice—a field by no means overcrowded in English texts and publications.

The new 1929 edition has been entirely revised and rewritten, and many

valuable additions have been made. These include observations of the author while in Europe, and also data from authoritative sources of information available only since the publication of the first edition. The latter include, besides American sources, references from the "Waldbau" of Anton Bühler and also of Karl Gayer, and from the writings, especially in the matter of definition of crown classes, of the Swedish forester Schotte. The idea of the "Continuous Forest" (Dauerwaldwirtschaft) developed by Möller is also included and described.

A systematic scheme has been followed in the discussion of the standard silvicultural systems and methods of application. In each case very definite descriptions and diagrammatic representations of the theory are given, followed by a clear-cut and concise presentation of the more usual modifications of the system under discussion.

The place of fire protection in all systems of silvicultural management has been more fully recognized and given the weight and attention that its importance deserves. Chapter XIV on this subject has been rewritten, and Chapters XV to XVII are added on the same topic.

The chapters on insect and fungus diseases have also been remodeled and amplified, and the chapters on protection from grazing and protection from natural phenomena have been strengthened.

Citations of silvicultural practice in the United States are given under each system of management with suggestions and recommendations for changes and adaptations in application.

It is made clear that although based on European systems, the practice of silviculture in the United States has already developed along somewhat original lines, on account of the differences in economic conditions, the more varied composition of the forest, and the wide variety of topographic and physiographic conditions.

Valuable additions have been made to the list of references at the end of each chapter, and the whole subject has been brought up to date and rounded out in a most competent way.

While the book is especially and admirably adapted as a text for forestry students, it is equally valuable as a source of sound information and technique for the layman.

It should be a great aid in bringing about a better understanding of the practice of silviculture by the private owner of timber lands, in whose hands still rests the title to about 80 per cent of the forest lands in the United States. For it is in convincing and converting the private owner, rather than in his coercion on the part of state and federal government, that we must look for the real solution of our forest conservation problem in the United States. As is well stated in this volume in discussing the present practice of so-called forestry by large corporations: "Unfortunately it often happens that the forestry department and the logging department are divorced and have different goals—the one continuous production of forest crops, the other, cheap logs."

This condition is today a very real and a very vital one. It should be remedied. "The Practice of Silviculture" should be a real aid to this end, when it can be shown that continuous production of forest crops will in the

end provide less idle land, a continuous supply of logs for our mills, more work and money for our industries, and more income for our government.

JOHN M. BRISCOE.



Waldtypen: Klassifikation und ihre volkswirtschaftliche Bedeutung. (A classification of forest types, and their social significance.) By Arthur Freiherrn von Kruedener. *Erster Band, 122S. J. Neumann, Neudamm, 1927.*

This is the first volume of a work by Baron von Kruedener, formerly the chief of technical forest management at the Russian court. A second volume will be issued later treating of the Biological Characteristics of the Separate Forest Types. The work is translated from Russian to German by the author, and quite naturally deals almost wholly with Russian forest types.

Classifications of forest vegetation into "types" have been developed somewhat simultaneously and independently of each other in Finland by Cajander and in Russia by Morosoff. While the former distinguishes types principally on the basis of ground vegetation, von Kruedener defines the Morosoff types as definite plant communities which have formed under definite climatic, soil, and geologic conditions. The author points out that Russian peasants have long recognized differences in soil and vegetational types, arising from different combinations of soil and moisture conditions. Ground water and drainage are of prime importance. The present study is an attempt to place these observations on a scientific basis and to classify them.

The first volume is divided into two parts of equal length. The first part deals with "foundations" and discusses the climatic, physiographic, geologic, and soil factors as bases for differences in forest vegetation. A division of European Russia is made into forest regions, or zones, based largely on soils and climate. The chief zones are:

The pre-steppe zone—where evaporation exceeds precipitation.

The forest-steppe zone—where evaporation and precipitation more or less balance.

The podsol-forest zone—where evaporation removes only a portion of the precipitation.

These zones are in turn sub-divided into a number of sub-zones.

In the second part, the author takes up more in detail the influences of

a. The mineral soil.

b. The soil formed in whole or in part of vegetable matter, i. e., humus and peat.

The final classification of types is given in a table. Fifteen types based on soil are each classified in turn in ten categories depending on their moisture conditions. There are thus 150 possible combinations, which can be designated by a combination of numbers and letters. Ten charts are appended showing cross sections of stands, with their underlying soil types and the position of the water table.

Perhaps it can be gleaned from even so short a description of the book that what von Kruegener has done is to classify physical types. Such a basis may work quite well where the existing vegetation is more profoundly influenced by physical factors than from interference by man. Cajander's indicator types are not

mentioned in the present work. While of chief interest to Russian foresters, many of the conditions described resemble those of northern Canada. Use of physical types is constantly made by practical foresters and woodsmen, whether they are aware of it or not, and Baron von Kruegener's presentation of their foundations should be of interest, especially at a time when a movement is under way to revise the classification of forest types in the eastern United States.

HENRY I. BALDWIN.



Forestry in the Pacific Northwest.

By Hugo Winkenwerder, Dean, College of Forestry, University of Washington. *Published by American Tree Association, 1928. Pp. 48.*

This is a bulletin in the regional forestry series being issued by the American Tree Association. The first, "Forestry in the South," was published in 1927, and a third, "Forestry in California," is now in preparation. Appropriately, there is a foreword by Mr. Charles Lathrop Pack.

Winkenwerder's very readable circular deals with the forestry situations in the States of Washington, Oregon, Idaho, Montana, and the Alaskan Coast. In Oregon and Washington there are estimated to be 25,000,000 acres suitable only for permanent timber production, while in the Inland Empire there are estimated to be 36,500,000 acres better adapted to forest growth than to any other use.

There are thirteen chapters into which the author has condensed a tremendous number of facts and figures about the

forests, their utilization and protection, the progress and needs of forestry in the region, the lumber industry, insect and fungus injury, the status of forest taxation, municipal forestry, and forestry education.

The beginnings of compulsory fire patrol in the Northwest, its steady growth and gradual refinement, are credited to Oregon and Washington. Forest Service policies on the National Forests are contrasted with possible state ownership of federal forest lands, to the detriment of the latter. Forestry laws of each of the States are sketched. Progress of private or commercial forestry in the Pacific Northwest is touched on and due recognition given to the growth and effective work of the private protective associations (starting in Idaho in 1906), which perhaps function better in this region than elsewhere in the United States. There are at present some thirty private protective organizations extending from California to Montana. The economic importance of the forests to the Northwest is realized when it is stated that 50 per cent of the industrial payrolls of Oregon and Washington is furnished by the lumber industry.

The last chapter appropriately sums up the major needs of forestry in the region. These the author lists under the heads: Active State Forestry Departments, Protection, Closer Utilization, Investigation or Research, Public Education, and Tax Legislation.

The booklet presents the forestry situation in the Pacific Northwest in a popular, yet logical and accurate manner, not to be found elsewhere in print, and should be of very real service in promoting a better popular understanding of

what the aims of forestry are and how these aims may be realized. The pamphlet deserves a permanent place in the schools of the region, as well as being a valuable reference work for public libraries, for, as the author says, "The forests of the Pacific Northwest occupy a unique position among our nation's timberlands. They are our greatest source of timber supply and they are our last great stand of virgin timber."

JNO. D. GUTHRIE.



Our Forests, A National Problem.

By Ben. J. Rohan, superintendent of Schools, Appleton, Wisconsin. C. C. Nelson Publishing Co., Appleton, 1929. *Pp.* xviii + 187, 128 *illus. and figs.* 1928.

"A new philosophy of education has recently spread over America," we are told by the editor of this new text on forestry, the first of a series of eight units to be designated "exploratory science." The slogan of that philosophy is, in the words of the editor, C. O. Davis, Professor of Secondary Education, University of Michigan, "a secondary school training for every normal boy and girl." We are advised that the book has been prepared primarily for the use of these students in the seventh, eighth, and ninth grades—"the grades marking the period of early adolescence and now frequently organized as a junior high school"—and that its objective is not so much to transmit "a mass of formal information," as to make young people aware of modern opportunities and suitably prepared "for effective participation in the world in which they must live."

Trained educators will have to pass final judgment on whether or not the book will fulfil this high mission, but the forester whose work is essentially that of forest education outside of the class room will welcome it for the "forestry consciousness" that it is certain to develop in the minds of those who use it.

A foreword has been written by S. T. Dana. There are 18 chapters, in which we find the forest discussed in its relation to the home, industry, water supply, control of rivers, soil, erosion, temperature moderation, insect enemies, recreation, and standard of living. Uses of wood, wood waste, forest conditions, a brief review of what other nations have done, and, finally, an intelligent discussion of America's needs and opportunities, are also included.

Through the "Study Helps"—carefully planned questions at the end of each chapter—the author has developed a plan of presentation which should be most useful to the teacher, and which, in the opinion of the reviewer, does much more to bring out possible latent interests of the youthful student than the plain descriptive or expository statements in the text.

Numerous references to sections of other books and bulletins on forestry, which have a close bearing on the topics under discussion, are especially valuable to the teacher who is beginning to teach forest appreciation.

FRED B. TRENK.

Bibliography on Woods of the World, Exclusive of the Temperate Region of North America and with Emphasis on Tropical Woods. By Major George P. Ahern and Helen K. Newton. Tropical Plant Research Foundation. Scientific Contributions, No. 10. Pp. 77, Titles 1530. Published by the American Society of Mechanical Engineers, New York, 1928.

This bibliography, the most important in its field, is now in its final and printed form and covers the literature upon the subject available up to 1928. The present issue contains 1530 titles, nearly 200 more than in the preliminary mimeographed edition which appeared in 1927. Like its predecessor, it lays particular emphasis on tropical woods and excludes all but general works on the woods of the temperate region of North America. The authors might have stated that the woods of Europe also are excluded, because for that continent there are only 15 titles, most of which might have been included with the general works.

The preliminary issue was reviewed in the May, 1927, number of the JOURNAL OF FORESTRY. The reviewer feels that in the final issue insufficient credit has been given to Professor S. J. Record of Yale University, the originator of the bibliography and the compiler of more than half of the titles.

EMANUEL FRITZ.

NOTES

COOPERATION AND THE CLARKE-McNARY LAW¹

The Clarke-McNary Law was passed on June 7, 1924. In its appropriation authorizations it indicated a \$10,000,000 forest fire protection job ahead, one-quarter of which would be paid for by the federal government, one-quarter by the states, and one-half by private owners. It is very much to the point to inquire as to progress made under the operation of this law and indications for the future. I am not at this time going to call attention to the many things that are promising and upon which we might congratulate ourselves.

Purely from the financial point of view the situation is not entirely encouraging. The present year's federal appropriation for fire protection is a little less than half of its share of the amount needed to complete the program and the last three annual increases have averaged less than \$200,000. In the case of the thirteen coöperating States in the South the total of funds budgeted for forest fire protection for the present fiscal year is \$960,615, as against \$4,300,300 estimated as necessary to secure adequate protection. The area of forest land needing protection in these states is estimated as 185,267,540 acres, of which 60,420,290 acres were protected during the

last calendar year. We have far to go in getting protection, and yet the protection of forests from fire is only the first and the elementary step in forestry.

If the administration and Congress are not interested in getting the Clarke-McNary Law Section 2 appropriation up to the amount authorized, why are they not? Congress responds to the demand of the public. Why is not the demand of the public more insistent? The reasons are no doubt many and varied. First among them is perhaps the fact that the need is not insistently felt. We must have leaders outside and inside the forestry profession to secure a viewing of the forestry problem in its true proportions. And these leaders must be sought after and developed with a true perspective. Too often those responsible for state legislation and appropriations look upon the problem, if they look upon it at all, as from the wrong end of a telescope. The perspective is all wrong. The forestry problem must be laid out on the same scale as are other big problems of the day, in its true proportions, and this should go far toward creating that essential demand which does not now exist. This means the careful formulation and effective presentation of adequate state and regional forestry policies and programs. I am convinced that much can be done by greater activity along this line.

Another consideration which seems to me to be fundamental is this: Have we in our appreciation for the need of fire

¹Taken from a paper presented before the Appalachian Section, Society of American Foresters, Raleigh, North Carolina, December 10, 1928.

protection allowed the public to mistake the means for the end? Have we given too little attention to the demonstration of the desirability and practicability of forest management? Have we proved that it will pay, and have we convinced our friends that the proof is sound? Fire prevention and control in itself may not be at all interesting to the private owner of timber land. Increased profit from that land is the thing of outstanding interest. Have we at least used the means at our disposal to demonstrate and make known the difference between the burned and the unburned forest in growth of timber, in run of gum, in fertility of soil—all as a part of our fire protection job? It is of the greatest importance that these things be done increasingly so that the motive power of self-interest can be harnessed to the protection machine.

The coöperative plan of public activity in forestry is on trial in the United States today. A strong pull and a long pull is needed to get anything like the public support for forestry which its true economic importance to the state and nation demand. We can have great faith in the power of coöperation. Nothing can withstand it—and we must make it 100 per cent effective.

A. B. HASTINGS.



THE WENATCHEE VARIETY OF DOUGLAS FIR

A rather distinctive variety of Douglas fir, *Pseudotsuga taxifolia*, is that found in the Wenatchee National Forest on the eastern extremities of the Cascade

Mountains in the State of Washington. The exact distribution of this variety is not known, but trees of this character have been noted by the writer as occurring in the vicinity of Bee Hive Mountain in Sec. 12, T. 21 N., R. 19 E. at elevations of from about 3,000 to 4,500 feet. Specimens of both the regular form and the Wenatchee variety are found closely adjacent to each other.

The distinctive characteristic of the Wenatchee variety of Douglas fir is that the needles on practically all portions of the tree are upturned in a way that is more typical of the upper branches of the balsams than of the regular form of Douglas fir. In fact, the general appearance of this Wenatchee Douglas fir at first glance is very much that of a lowland white fir, with which it associates in the region where found. The cones and buds, however, are typical of the true Douglas fir, and it is thought that possibly this variation is due to some local condition which causes the needles to curl upward in a comb-like fashion in place of the usual method whereby the needles extend out in all directions from the stems. In order to demonstrate the characteristics of the Wenatchee variety, it is planned to raise some plants from seed obtained from trees having this unusual leaf formation.

E. J. HANZLIK.



YALE SCHOOL OF FORESTRY RECEIVES \$200,000 GIFT

The Yale School of Forestry has received a gift of over \$200,000 from Charles Lathrop Pack, president of the

American Tree Association, for the establishment of a foundation to advance the knowledge and practice of forestry in the United States through field investigations and experiments and through developing examples of applied forestry. The first work under the foundation will be a study, by Dean Henry S. Graves, of forestry as now practiced in the United States. The aim of the study is to determine how an educational institution like Yale may contribute to the progress of forestry, through experimental and demonstration forests and in other ways.

According to Dean Graves, "Mr. Pack's gift is of importance not only in strengthening the work of the Yale School of Forestry, but also in extending the knowledge and practice of forestry. One of the greatest needs today is to bridge over the gap between theory and practice, and to show how the principles of forestry may be better applied in the forest, in light of our prevailing economic conditions. The experimental and demonstration forests of the School are well adapted for the work contemplated under the foundation. These forests are centers of forest activities where the student, the scientist, the landowner, and layman may see displayed the methods and results of forestry practice. They are the laboratories for field investigations and experiment, for practical instruction, and for the trial of different methods of forestry. Here one may see what forestry practice really is, what it costs, and what it accomplishes. Yale's contribution to forestry, through the results of its experiments, through the development of methods of silviculture and management, and through its public educational work, will be greatly increased by Mr. Pack's foresighted gift."

SCHLICH MEMORIAL PRIZE

The Memorial Fund, amounting to £1,700, subscribed by friends and admirers of the late Sir Wm. Schlich, yielded in 1928 its first instalment of interest. In accordance with the decision of the Trustees that the interest should be paid each year in rotation to different parts of the British Empire and to the United States of America, and devoted to some purpose calculated to further the cause of forestry, the sum of £75, representing interest for the first year, was handed over to Australia (during the visit of the Empire Forestry Conference). It was decided in this instance that the memorial should take the form of a gold medal to be awarded annually to the best student at the Australian Forestry School, Canberra. The sum received by Australia has now been suitably invested with this object in view.

At the closing ceremony of the Australian Forestry School in December, marking the end of the third session, Mr. C. E. Lane-Poole, Inspector General of Forests for the Commonwealth, who is Acting Principal of the School, announced the name of the first winner of the Schlich Memorial Prize, Mr. L. J. Rogers, of Queensland.

The decision of the Trustees which resulted in making an annual Schlich Memorial Prize available for forestry students of the Commonwealth is in the best interests of Australian forestry. The students of the Canberra School are recruited from every state in the Commonwealth and the healthy rivalry engendered in competition for the prize will do much to stimulate future coöperation amongst trainees of this young institution when they have graduated into the forest services of their respective states.

SOCIETY AFFAIRS

CALIFORNIA SECTION HOLDS FIRST ANNUAL MEETING

At 9.30 A. M., December 20, 1928, Chairman C. Stowell Smith called to order the first annual meeting of the California Section of the Society of American Foresters. Over 150 men interested in forestry in all its phases were gathered in the auditorium of the Pacific Gas and Electric Building to listen to the program and discussion on the forest problems of California.

Chairman Smith briefly outlined the history of the California Section and told of the difficulties of maintaining close bonds of professional fellowship among the wide-flung body of foresters in this state. This annual meeting, he said, was an attempt to bring them all closer together; to foster a stronger professional spirit; to prevent misunderstanding between private and public foresters; to exchange ideas; to keep field men in closer touch with what is going on in forestry; to develop a greater respect for and contentment in the forestry profession; to develop means for making the California Section of greater usefulness; and to encourage and develop the younger members. With this brief preface, he introduced the first speaker, Hon. Chester Rowell, known throughout the region as a publicist, journalist, and University Regent.

CHESTER ROWELL'S SPEECH

Mr. Rowell explained that he came to the meeting as a representative of the "great dunderheaded public," but proceeded to show not only a keen interest in what foresters are trying to do but surprising knowledge of the aims of forestry as well. Since Mr. Rowell's charm lies in his forceful expression and turn of phrase, we give herewith selections from his talk verbatim:

"The announcement in regard to these cups" (paper cups had been attached to the chair backs for cigarette ashes) "reminds me of a problem of psychology that you have with you all the time. You are dealing up in the mountains with men who live on the pavements. The instinctive thing to do with a cigarette is to throw it on the pavement, and these people that get temporarily into the forest have the almost impossible task of becoming conscious of what they have always done unconsciously. They throw their cigarettes into the forest, a thing which no civilized man would do consciously, but always does unconsciously. The man on the pavement isn't safe at large in the forest unless you can make him conscious of things he does unconsciously. Now it may be that you sometimes have things that you know you consciously have to remember; for instance, that those paper cups are there for use. It is one of the problems of life

to bring up into the consciousness these unconscious things.

"Another problem that you have is the habit of men thinking with their memories. It is perhaps the greatest obstacle to progress in the United States that a thing that always was so, of course, is so. I read recently that it is axiomatic that the government that is very close to the people is better than that farther away. But it isn't axiomatic. The government of the nation is certainly better than the government of most of our states. Every scientist knows and every ordinary man ought to know enough to look at the facts and not accept these axioms. It is axiomatic that all the older men of the forest learned forestry from the Piutes, they are sure of the Piute theory of forestry, and therefore you who learn your forestry in school and don't believe in the Piute theory evidently are not practical men. You have seen that sort of thing all your life. It simply illustrates the constant problem that has to do with human skulls that are a lot more wooden than some of the other products of the forest.

"You are representing a profession. Perhaps the most I can do is to offer myself as one example of those outside to encourage you to believe that there are other people who appreciate your profession. And I hope that those other people are really representative of the public sentiment of the community. Yours is the one profession that lives in work under the form of eternity. You face problems that our grandchildren shall profit by. Yours is the one business, the one profession, the one executive occupation that deals with time in a longer limit than the life of man, the life of the tree which is continuous, and you deal

with the permanences of life. You deal with it definitely and specifically in the forests. You deal with it also in the relations of the forest to life. I have had the good fortune to wander about the earth, and therefore have seen forestry in all its stages from the pre-forestry stage to the stage where there were forests that had been cultivated for centuries. One who has done that cannot resist the appeal to his imagination of this long-time profession.

"I remember as a boy in Michigan seeing the pre-forestry stage, in the days when lumbering was not as conservative, perhaps not as enlightened, as it is now. At any rate, I remember once talking to one of the leading lumbermen of Michigan, and he knew something about forests and principles of forestry, and so I said to him: 'Why wouldn't it be wise to let the Canadians cut up their forests first and let us save ours?' 'No,' he said, 'it is a race between the lumberman and the fire; one or the other is going to destroy it, and it is much better that we destroy it first.' I suppose he might have been right. I saw people start out to do those same things to our California forests. They have learned; some of your foresters have helped teach them. They have learned out of their own experience and their own foresight those methods of forestry which will harvest the forest instead of mining it. I have seen charred hills with nothing growing on them where green forests once grew, and I have seen the results of not having any forestry, that whole devastation of life which comes after you live long enough in a country and do not preserve your forests. You know that theory. If you go into the countries that don't know it, you will see vividly before you the con-

sequences of your profession not having been practised. Well, in this country there were times when it wouldn't be done, but fortunately it has passed and the forests of America are relatively safe.

"It is rather interesting to realize the relation of civilization in America to the wooden house. When the pioneers of America were first going out into the great plains, they built sod houses and adobe houses. All right, they have been building those houses in Egypt for 5000 years. It would rather shock you to see the intensive conservation of wood in a country like that. There isn't wood enough in Egypt, so they mix cornstalks with mud. You see little twigs used that the foresters in this country would never think of using, and they are the lumber of the country where wood is as scarce as that and mud makes houses. Mud makes for stagnation in civilization. But soon the pioneers built log houses. The second generation built railroads, and America built its houses out of wood. That means that everybody has a house; that means that the characteristic civilization of America has been based on the individual house of one family, and that couldn't have happened if we had had to build our houses of anything but wood. That has happened, but it may not happen here many generations longer. But the fact that you could build up almost over night a town and a village; that you could build a decent house on the farm; and that you could build one house for each member, I think, has had as much to do as any one element in the development of this thing which is unique to this country. Even now, if we had to build our houses out of brick and stone, either we wouldn't have as many houses as we have, or the workmen who

built them wouldn't get the same amount of wages. Our civilization depends upon building houses the way they don't build them in other countries.

"You have also had the task of co-operating together in cultivating a long-time view toward the forests. Those who are lumbermen have had to put into their business an ideal which is beyond the standards of other business. You can prove mathematically that in many cases this preserving of the forests to guarantee that our children and our grandchildren shall have water as well as we, is a process that does not pay. You can prove that the wood in the next century isn't worth as much as the cost of planting. A few cents an acre mounts up in compound interest. And you have a 100 per cent loss before the forest has been grown. In spite of that, we have conservative lumbering. It is good news; it is a good thing to do, because business has more responsibilities than this year's profits; and that is especially true of those businesses that can be permanent. There are reasons and better reasons than the bookkeeper can find in his balance sheet why these things have to be done; but the bookkeeping mind wouldn't know that, and the lumberman has learned it. He has had to do it by rising above the bookkeeping mind. I think that you have been rendering in that way to your business, and finally to all our businesses, a service, in raising the standard of measurement of values above the balance sheet standard. You can't raise it *away* from the balance sheet standard; it won't do to run any business except on good business principles, but there are more elements in business principles than some businesses know, and your business is one of those that has learned to think in time,

to provide for our grandchildren. So we have a certain consciousness of being the custodian of the duty of one generation to the other. If democracy cannot rise to that conception, something else will. You are in that sense the very custodians of democracy.

"The people have come to live on the pavements mostly. The Park Service can't do the whole thing in the spiritual value of the forests. It will never be economically possible to set aside sufficient areas for the Park Service. There are forests in Europe that have been harvested for two or three centuries, where there isn't a tree in the whole forest that does not depend on the work of foresters, and yet they are still places of beauty—places of spiritual refreshment as well as places that profitably produce good lumber. You have that task also, the spiritual preservation in the future of the human civilization that wasn't born to live in cities.

"The most I hope to do, as a representative of the great dunderheaded public, is to render to you this tribute just to remind you that you are not only much appreciated but some of the things you know so intimately are also much in the minds of those outside your profession."

COOPERATION AND MANAGEMENT PLANS

W. G. Durbin, Supervisor of the Lassen National Forest, next spoke on "Solving Forest Service Problems through Coöperation." He was followed by Supervisor M. A. Benedict, of the Sierra National Forest, who presented a paper on "Local Values of Permanent Forest Management." Both papers will appear in an early issue of the JOURNAL OF FORESTRY.

Benedict also mentioned the results of the "forest tours" he conducted last summer, on which agricultural and business men have been taken out to be shown how the forests touch their interests. Their reaction has been good but they say in effect, "What are you going to do about private lands," and, "Now you have shown us the problem, what shall we do about it?" They are coming to us for advice. "I feel that if the Society of American Foresters is going to function at all as an influence in public opinion . . . we must present to the agricultural interests of this state a very definite and practical proposal and solution of private forestry problems."

Burnett Sanford, of the Sugar Pine Lumber Company, agreed to Benedict's plan in general, but was inclined to take exception to his criticism of the private land situation, claiming rapid progress toward industrial forestry—particularly in mental attitude. No longer is the lumberman opposed to the proposition; he only asks to be shown what he can do economically, and is on the road to finding out himself the solution of this problem. Foresters have told him he ought to reform but have been unable to tell him how to do it, and so he is tackling the problem himself, with promise that the professional forester instead of being a leader will turn out a tail-ender, if he doesn't look out.

Swift Berry stated that it was his belief that cut-over land conserved water as well as or better than virgin timber.

Frank Bonner stressed the fact that blanket conclusions are impossible; each watershed constitutes a separate problem. Sometimes, as in a lava region with pervious rocks, there is a natural reservoir regardless of forest cover. Large reser-

voirs will usually hold large quantities of water better than a forest, although here the evils of sedimentation may offset the advantages of an artificial reservoir.

J. R. Hall emphasized the need of interesting the agricultural population in the right kind of watershed protection. As it is, the Forest Service itself is under suspicion as a ruiner of watersheds and private owners are unmercifully condemned. He stressed the need of facts and stated as his personal opinion that logging alone (without fire) was not destructive to watershed values even on private lands.

State Forester M. B. Pratt stated that conservation is even now being forced by water users and will be more so in the future, and that the Forest Service ought to initiate a policy of acquiring lands chiefly valuable for their water resources as it appears impossible for the state to embark on such a program. Owners of water rights, especially such absentee owners as water districts, often far removed from the source of supply, ought to own the watersheds to safeguard their supplies, particularly where the local inhabitants are inveterate "burners."

Assistant District Forester T. D. Woodbury expressed doubt as to Sanford's claim that the lumber industry is making much progress in general toward better forestry. The Clarke-McNary Act was sort of a truce, during which the lumber industry was supposed to clean house and to take steps toward more forestry and less destruction. In his opinion it is doubtful whether more than sporadic attempts in this direction have been made. True, considerable developments have been made in fire protection, but little has been done toward leaving ade-

quate growing stock looking toward continuous forest cropping. The question is whether we are moving fast enough or whether another set-to will not be required to develop enough speed to head off the timber depletion of the nation.

Director E. I. Kotok of the California Forest Experiment Station explained attempts that are being made to win industry on an economic basis, to prove the advantages of an extended life (if not perpetual life) to the operation.

D. T. Mason refused to see matters as darkly as Woodbury, although he was less optimistic than Sanford. He stated that he was sure that in the near future we would see the encouraging combination of better forestry and lower costs and the steady development of sustained yield operation.

District Forester S. B. Show, referring to Woodbury's remarks, expressed the opinion that progress probably is too slow and that the voluntary action of lumbermen will probably have to be speeded up through legislative action in spite of obvious disadvantages. The force of public opinion, particularly of water users, is bound to be felt more and more.

Fred G. Stevenot, Director, California Department of Natural Resources, spoke at some length and very forcefully upon the problem of better forest management. He pointed out the fundamental similarity between the gas and oil conservation situation and that of forest conservation, but showed that the gas and oil situation is now in the stage that foresters look forward to. The public is a unit for gas and oil conservation; the large operators are for it whole-heartedly; the situation is crystallized in every legislative remedy, but it doesn't work, and waste goes on. Control from the top is ex-

tremely difficult and he advised foresters to be patient, to work for better practice, improve at the bottom, and not try to get the whole situation by the tail at once. Such a policy arouses antagonism and all the dangers of over-reaching, and when the goal is reached it is destitute of real value. The increase in the state budget shows an appreciation of the present policy of quiet, slow work at the fundamentals of better practice on the ground, and he advised strongly that such a policy be maintained.

The morning session then closed with two reels of fishing and wild life pictures presented by Paul Fair.

MORTENSEN ON LUMBER COMPANY PROBLEMS

H. D. Mortensen, President, Pelican Bay Lumber Co., Klamath Falls, Oregon, opened the afternoon session with an interesting paper in an optimistic strain outlining conditions and problems of the lumber industry. He presented the viewpoint that growing timber and harvesting it is an economic problem and "forestry" must be profitable if lumbermen are to accept it. The costs of growing timber must be low, which means low carrying charges—taxes and protection, the latter realizable by the government assuming a fair share of protection costs. Only in such a way can selective logging prove financially possible.

The industry needs science, much of it, but "practical" science that does not advocate practices that are financially impossible. Radical departures from present practices are dangerous and the best progress in the long run will result from "making speed slowly." The Forest Ser-

vice should market its stumpage slowly, and it should be sold to keep established concerns going, not to introduce more competition, and from this standpoint the present system of competitive bidding for stumpage is bad. Given good coöperation by the public in handling the financial burdens of timber growing and adequate and practical scientific advice, industrial forestry will develop rapidly along sound lines.

COLGAN ON FIRE PROTECTION

R. A. Colgan, Superintendent, Milling and Logging Department, Diamond Match Co., gave a brief paper nominally on forestry in the pine region, but it was pointed and barbed and gave rise to some snappy comment. In brief, he questioned the use of spending money for protection as his company did when, as last year, fires coming in from the outside supposedly "adequately" protected by the state on one side and the Forest Service on the other, might burn over 30,000 acres of land bearing splendid young growth.

M. A. Benedict wanted to know where the "outside" fires came from and was informed that they came off the National Forest.

District Forester Show, called on for defense, admitted they had bad fires and that it was a job bigger than anybody supposed to prevent them and keep the fire fighting forces equipped and up to standard. Benedict took the position that this misfortune of Colgan's was a fluke; small areas may get hit hard but over big areas the burns will be under 1 per cent annually. Colgan was willing to admit this but pointed out that it didn't mean much, because here was an area,

one of the best forest producing areas in California, reproduction dense, easily secured, growth rapid, quality high, lots of sugar pine, and the losses ran 5 per cent. The area deserves better protection than the average but does not get it. Under the circumstances the fact that so little poor land is burned that the state average falls below 1 per cent is entirely without meaning. Unless the state and Forest Service give protection adequate to the values involved, the companies will have to take over the entire protection work and make it adequate.

SCHOFIELD ON REDWOOD REFORESTATION

"Forest Practice in the Redwood Region," by W. R. Schofield, was a technical paper dealing with the concrete results of the reforestation program. It will be printed in an early issue of the JOURNAL.

Willis G. Corbitt stressed the factor of shade in getting survival, and cited good results from placing chunks of wood or bark south of the trees by which 5 to 10 per cent greater survival has been secured. The advantages of Port Orford cedar and spruce appear to be in better root systems of equal-aged stock.

V. B. Davis of the Union Lumber Co. stated that Schofield's results tallied very well with those secured in Mendocino County.

DUNWOODY ON FIRE PROTECTION

"Who Should Bear the Responsibility for Providing Fire Protection on Lands Outside the National Forests?" was the theme of a paper by C. G. Dunwoody, Director, Department of Conservation, California Development Association, which will also be published in the JOURNAL.

State Forester M. B. Pratt, in reply to Mr. Dunwoody, claimed that real progress has been made and a long fight waged to develop the state fire fighting system. The Board of Forestry has worked hard and there is now reason to be optimistic over the outcome in spite of the many difficulties—climatic, vegetational, and psychological—confronting the State in its protective work in the foothill zone.

Benedict said the state ought to have protected Colgan's lands (see earlier discussion), but Colgan felt that there was more hope in associations concentrating on small areas. The state protective forces on the long ribbon of foothill land are too "strung out" for effective work.

Dunwoody thought that companies ought to keep the equivalent of "fire extinguishers" in a factory, but that the state should furnish the "fire department."

Woodbridge Metcalf discussed the rural fire problem in general, the biggest national fire problem at the present time, requiring new standards, new equipment, and so on. City firemen are ignorant of the technique and there is a big chance for foresters to coöperate effectively—and they are doing so.

BLACK ON KEEPING UP-TO-DATE

A short paper by S. R. Black, Secretary, California Forest Protective Association, "Are Foresters Keeping up with Forestry?" was read by E. I. Kotok in the absence of Mr. Black, and is to be printed in the JOURNAL. The path of forestry during the past decade was reviewed by the author, and the progress in legislation, protection, State coöperation, research, and industrial forestry was emphasized. Mr. Black did not at-

tempt to answer his question for the profession as a whole or even for any group but counseled all to search themselves to determine whether they themselves were personally keeping up with the profession.

Mr. Kotok, called upon for comments, expressed doubt as to whether we as foresters measure up as we should in seeing and appreciating both sides of the public-private forestry question.

MULFORD ON GETTING NEW BLOOD

The final paper of the day (to be published in the JOURNAL) was a plea by Prof. Walter Mulford, of the Division of Forestry, University of California, for more first class young men in forestry. He emphasized the satisfaction of forestry as a life work from the ranger and guard through all the various ranks, pointing out that it is a good profession to live in from top to bottom. Nevertheless fine young men are not infrequently discouraged many times by foresters who tell them that "openings" are few and do not offer adequate rewards for ability.

T. D. Woodbury asked who it was that knocked the profession, to which Mulford replied that he could give no names. Woodbury felt that very little knocking is now being done.

On motion of Mr. Kotok a committee was appointed to study ways and means of recruiting high class prospects.

BUSINESS SESSION

A brief business meeting followed, several men expressing their sentiments regarding this type of meeting and allied affairs. Mr. C. G. Dunwoody was especially pointed: "It is worth a dollar to come here to this meeting, but to come

here and go away, what have we accomplished? There has been enough brought out to crystallize some definite recommendations as to what should go out to the people of this state to take the place of the *stuff* that has been handed out, and we want it. I would suggest a definite committee to take an active hand in the guidance of education in forestry, telling the whole story, occupying itself with a careful study of the situation, and disseminating it to the poor people of this state who don't know what forestry is about."

Mulford moved that the gist of Dunwoody's remarks be placed in the form of a motion. Seconded and unanimously passed.

C. L. Hill moved that this meeting be made an annual affair. Seconded and passed unanimously.

C. L. Hill moved a vote of thanks to the Pacific Gas & Electric Company, for the use of its auditorium and the many courtesies extended. Seconded and unanimously passed.

ATTENDANCE RECORD

The meeting was attended by 151, of whom 77 are members of the California Section and 4 members of other sections. Affiliations of those registered are as follows :

U. S. Forest Service.....	59
Foresters with lumber organizations....	20
State Division of Forestry.....	15
Calif. Forest Experiment Station.....	12
Other U. S. Departments (Path., Ent., Nat. Park, Indian, Revenue).....	13
Students, Univ. of Calif.....	9
Faculty, Univ. of Calif.....	7
Unclassified (mostly foresters in various fields)	16
Total	151

DINNER

The dinner was held at the Stewart Hotel and was attended by 109, of whom 6 or 8 were not registered at the meeting during the day. R. W. Ayres acted as toastmaster. There were no formal talks.

NORTHERN ROCKY MOUNTAIN
SECTION ACTIVE

At the January 11 meeting a committee consisting of W. W. White, Roscoe Haines, and D. S. Olson was appointed to investigate the European larch canker and to take such action as seems justified. A communication from C. S. Chapman indicated the seriousness of the situation and the opportunity to further remedial measures by writing to members of Congress. Standing committees on entertainment and legislation were appointed, and Theo. Shoemaker was appointed to report Section affairs to the JOURNAL.

Taking advantage of their presence in Missoula to attend the annual meeting of the District Investigative Committee, the program for the evening included a paper by Dean F. G. Miller on "A Forest Survey of Benewah County, Idaho," and a talk by J. C. Evenden, illustrated by charts and maps, on the history of the mountain pine beetle infestations of the region.

Dean Miller's paper brought out that the purpose of the Benewah County survey, which will extend over two field seasons with a four-man party, is to ascertain the location of cut and burned lands and what they contain in the way of residual stands and reproduction, in the hope that these data will be of value

in the solution of the most serious forest problem in this and other Idaho counties, namely the problem of cut-over and burned-over lands in private ownership. While the field work is only half done and the data for the areas covered have not been compiled, Dean Miller was able to say that in general the burned-over lands are in better condition than cut-over lands for future timber production, and that of both classes there is surprisingly little that is not restocking satisfactorily. Most of the area covered is within an area proposed for addition to the St. Joe National Forest, and the discussion brought out the fact that many believe federal ownership will prove the best solution.

Mr. Evenden's account of the development of the present overwhelming attack of the beetles in the Big Hole, Bitterroot, and Salmon River drainages outlined its spread from the outbreak in 1909 in the Swan River country in the Flathead Forest, southward across the Missoula Forest to the Bitterroot and Beaverhead areas which now form the battle front. The Salmon River outbreak in District 4 may be a further spread of this same infestation, or more likely has developed in Idaho and progressed to a point where the two have virtually met. In spite of the expenditure of some \$95,000 in the Big Hole last spring the infestation gained in area and intensity during 1928, the beetles having in many places crossed open country for several miles to attack new bodies of timber. There is hope that by using the wider barriers of open land surrounding the whole region to break the force of the attack, we may be able to keep cleaned up beyond and thus prevent its

onward march to new regions. The only silver lining to the cloud of gloom cast by this picture came out in the discussion when it was pointed out that in the wake of the infestation a large percentage of the area crossed escaped attack, and that even in the worst of it from 40 to 60 per cent of the timber was not killed. In the Swan River, for example, the forest has made a marvelous recovery in fifteen years.

The subjects for the meeting on January 21 were :

1. Of what benefit is forest school training in the ranger job?
2. How long will the forest school graduate be satisfied to remain in the ranger grade?

The discussions were led by Rangers Space and Crowell, graduates who have been district rangers long enough to get squared away. Both were of the opinion that forest school training has been a help. Space named a number of subjects taken which he had not been able to use in the ranger job, including chemistry, higher mathematics, and wood technology. He believes that more practical work should be included in the forest school courses, and mentioned packing, saw filing, and improvement construction work. Crowell believes that all of the work taken in school will prove worth while, although he has not used some of it in the ranger work.

Both agreed that a year or two of training under an experienced ranger is desirable before taking the district ranger position. It was also brought out by these men and in the discussion that there is too much of a tendency to turn new rangers loose on a district without

enough guidance and supervision to see that they get off to a good start.

As to the time a technically trained man will remain satisfied in the ranger grade, Space felt that the limit would be at the age of 35, and that if he didn't reach a higher position by that time he would be justified in concluding he had not really made good and should start in something else. Much of the spirited discussion which followed dealt with this point, and was rather strongly in support of the view that the ranger job is, or, if not, should be made, one entirely worth while for a life-long occupation. It was pointed out that while there is ample opportunity to build up to the so-called higher positions, and that promotion is open to every ranger who can show the requisite fitness, there will in the nature of things be many among the large percentage of technical men now entering the Service who will not be able to go higher. Along with the desirable conception of the ranger job as one worth while in itself, should go the determination on the part of the Service to go as far as it can to improve living conditions, salaries, etc., to make the conception a reality for the men who do the real work of the Service.

At the regular meeting of the Section on February 4, W. W. White, Chairman of the Larch Canker Committee, reported that replies had been received from five members of Congress to the letters sent them. All of these expressed interest. Congressman Leavitt advised that \$35,000 of the amount included in the appropriation bill for work of this nature was, as he understood it, for this particular purpose, and felt that this

amount was virtually assured. Senator Borah expressed the belief that the amount proposed should be increased.

Dean T. C. Spaulding presented "Some Notes on Educational Trends and Forest Schools Curricula." He showed that while in many professions the tendency has been for schools to raise the entrance requirements, lengthen the courses, and broaden the curricula to include more cultural subjects, the trend in forest schools has been in the opposite direction. He contended that in general forest school curricula are too narrow, resulting in virtually vocational training, but questioned whether the time has come when five- or six-year courses can be reestablished. He stressed the point that the primary function of the schools is teaching, and charged that forestry and other professional schools had drifted away from this through pressure or myopia into such secondary functions as leadership in forestry questions, research, etc. He said, "The man whose natural inclinations demand painstaking delving for a fundamental truth rarely has the basic qualities of a true teacher—the power to inspire youth, the patience, the sympathy, the tolerance, the enthusiasm for others, and the ability to correlate subject matter and mentality. Yet many schools are bending to pressure and are selecting staff members, first on their records as investigators, and but incidentally on their known or potential value as teachers." The point was made that the broadening of the curriculum meant either (1) the lengthening of forestry courses to correspond to medicine and law, or (2) a change in civil service examinations and the demands of the Forest Service and of industry as to the kind of finished product desired. The

discussion showed that there is considerable divergence of opinion with the preponderance, especially among graduates who have been out of school a short time, in favor of more of the cultural subjects necessary to a good education with less stress on subjects of a more strictly professional or vocational nature.



NORTHERN ROCKY MOUNTAIN SECTION STARTS ACTION AGAINST EUROPEAN LARCH CANKER

The following letter was sent by Charles D. Simpson, Chairman of the Northern Rocky Mountain Section, under date of January 21, 1929, to all United States senators and representatives from Montana and Idaho:

"Nearly two years ago European Larch Canker, a fungus disease, was found in Massachusetts and Rhode Island. The disease has been introduced through the importation of European larch nursery stock for ornamental planting. In Europe the disease is confined mainly to larch; in the United States, Douglas fir and western yellow (pondosa) pine, and larch are attacked. In Montana, Idaho, Oregon, and Washington, these are among the most important timber-producing species. The European Larch Canker is very destructive, perhaps a little less virulent than the chestnut blight, harder to fight and more dangerous than white pine blister rust, and threatens to destroy a great deal more timber than either.

"Forest pathologists believe that the disease will inevitably come West unless promptly eradicated in the East. Delay means increased cost of control and lessened chances for success. The East does

not have the same direct concern in stamping out the disease that the Northwest has, as the three tree species threatened are planted there only as small groves, arboretums, and for ornamental purposes on estates. As far as we can find out, not much is being done. The two states are not doing the job. The Federal Government seems to hesitate about interfering with what is perhaps usually a state function.

"Foresters, lumbermen, and timber owners of this region are gravely concerned over the introduction and failure to promptly control this disease. Indifference in Rhode Island and Massachusetts is endangering one of the chief resources of the four Northwest States and an appreciable portion of the nation's future timber supply. Is there not some way in which the Federal Government can exercise police power in a matter of common danger? Then there are the Federal quarantine powers that might be used to cause the two states to help. Since the local states do not have much value at stake, perhaps it is just that the Federal Government assume the responsibility for control.

"We are told that Agricultural Appropriation Bill, H. R. 15386, page 30, lines 7 to 14, includes \$35,000 for the study and eradication of European Larch Canker, though not specifically mentioned in the bill. It is a Forest Pathology item. We hope that you will watch for and support this particular item.

"Out here in the West it is feared that the appropriation of \$35,000 is merely a beginning, that a much larger sum should be available soon. We are relying on you to determine whether this amount is really adequate to meet the situation. I have written to you at length to acquaint

you with the seriousness of the situation and to point out the danger of delay. The Office of Forest Pathology, Bureau of Plant Industry, Department of Agriculture, can give you expert information on the European Larch Canker and can probably recommend a plan for action. Your assistance is needed in order to avoid a huge timber loss in the Northwest in the not very distant future.

"I am writing this letter on behalf of the Northern Rocky Mountain Section of the Society of American Foresters."



APPALACHIAN SECTION PLANS CONSTRUCTIVE PROJECTS

The eighth annual meeting of the Appalachian Section, held at Raleigh, N. C., opened at 9.30 A. M., December 10, 1928, in the State Department of Agriculture Building, with a discussion of the topic, "Aside from fire protection, what does forestry in the Southern Appalachians need most?" About thirty members were present. The discussion was started with papers by W. K. Beichler, District Forester of the North Carolina Department of Conservation and Development, and A. B. Hastings, Chief of State Coöperation, United States Forest Service, Washington, D. C. The best method of presenting forestry to the public was one of the main points in the discussion of education; while the subject of coöperation brought out the idea that the forestry situation represents an emergency, and, therefore, needs the benefits of co-operation. The importance of every one doing his own share of work, and receiving value commensurate with the work done was stressed. Tax reform and

continuous timber production on forest land were also subjects of considerable discussion in connection with the topic of the morning.

In the afternoon a field trip was made to the state forest nursery and Poole Woods. During the short period of less than a year, since the establishment of the forest nursery, remarkable progress has been made and the state is to be congratulated on the fact that it has been furnished with such a plant. The demand for the products of this nursery indicates a widespread feeling in the state that the practice of forestry is safe. Poole Woods is a tract of some 150 to 175 acres of virgin shortleaf and loblolly pine, located only three miles from Raleigh, which the state hopes to acquire as a demonstration forest and a field laboratory for the use of students of the forestry course which is being instituted at the North Carolina State College.

At 6.30 P. M. about thirty-five members and visitors assembled in the New Tea Room for a get-together dinner, at which everyone present displayed a real forester's appetite and a jolly good time was had by all. Mr. P. R. Camp, Vice-President of the Camp Manufacturing Company at Franklin, Va., gave a very able and interesting account of the practice of forestry on their holdings.

Following the dinner the meeting reconvened in the Board Room of the Agricultural Building for a business session. J. H. Buell, Chairman of the Program of Work Committee, presented a report recommending that a phenological study of important trees be undertaken for the following reasons:

1. The importance to foresters of information on the periods of budding, leafing, flowering, and fruiting of trees

and plants as they are affected by seasonal variation of climate is unquestioned.

2. Such data are wholly lacking for our region, and largely lacking for the rest of the country.

3. It is a project on which all members of the section can work.

4. It is a job that will run indefinitely, the records becoming more and more valuable as they accumulate and as the section's interest in the work increases from year to year.

It was voted to accept the report, and in order that the job may be begun on a sound basis it will be necessary to devote some time at the start to developing a plan for the study, to reconnoitering the territory, and to lining up men available as observers. The details of inaugurating this scheme will be in the hands of a committee appointed in conference with the director of the Appalachian Forest Experiment Station.

E. H. Frothingham, Chairman of the Forest Type Classification Committee, presented a report recommending a unified forest type classification for the eastern United States. A proposal, originating with the chairman of the committee, has been referred by Dr. Korstian to all the eastern sections of the Society and to President Butler, that the eastern sections combine to prepare a general classification of the forest types of the eastern United States. Four of the eastern sections have approved the proposal, one has rejected it, and the others have not had meetings since the subject was presented to them.

J. S. Holmes presented the report of the Committee on Forestry Education in the Secondary Schools. A discussion followed in which the desirability of a Smith-Hughes teacher in the public

schools and the need for teaching the handling of farm woodlots in secondary schools were stressed.

J. H. Buell presented a report of the Committee on the Cumulated JOURNAL Index. All of the eleven volumes of the Proceedings of the Society of American Foresters and the twenty-five volumes of the Forestry Quarterly and the JOURNAL OF FORESTRY have been indexed by individual members of the section, and subject cards prepared and double checked against author cards and the original citations in the respective volumes. The Appalachian Forest Experiment Station has assisted in the work with the understanding that the card index would become a part of the station's library index when the section has finished with it.

The chief job remaining to be done consists in preparing the manuscript for the printers and in thoroughly editing the manuscript thus prepared from the index. This work is to be undertaken as soon as possible and it is hoped to get the manuscript to the editor-in-chief of the JOURNAL OF FORESTRY in 1929.

Karl A. Swenning reported briefly on the work of the Committee on Industrial Forestry. Questionnaires have been sent out, and most of these have been returned to W. J. Damtoft, chairman of the committee, and forwarded to the chairman of the Society's committee.

The Secretary read the report of Verne Rhoades, Chairman of the Committee on Advertising for the JOURNAL. Five men have submitted detailed data on their purchases in accordance with the outlines furnished. A sixth has stated that his report will go through the Ohio Valley Section and three organizations have made no report. Recommendation

was made that the completed reports be forwarded to the secretary of the Society.

On the morning of December 11, a third session of the meeting was held in the State Department of Agriculture Building at which a paper on "Commercial and Legal Standards for the Measurement of Timber and Other Forest Products" was presented by F. H. Claridge, Assistant Forester, North Carolina Department of Conservation and Development. Graeber opened the discussion by stressing the need for standards for the measurement of all products. He pointed out that in the eastern part of the state as many as three cords are in use, containing 128 cubic feet, 160 cubic feet, and 180 cubic feet, and that when the proportional value is considered the price for the larger cord is usually much less than the price for the smaller cord. He also believes that the market for lumber in the log will increase more and more and that there should be a log rule that will measure as nearly as is humanly possible the actual lumber contents of the log.

Mr. Swenning, forester for the Meade Pulp and Paper Company, brought out the point that most pulp and paper as well as chestnut extract companies are buying 160 cubic feet per cord, and he felt that the state should not enact laws establishing a standard unit of measure to which all companies would be required to conform. He felt that since a cord varies so in actual wood content the only fair way would be to buy wood by weight, but because of the difficulty of determining a weight factor for the different species and different moisture contents he does not believe that this would be practicable. He called attention to the fact that 5-foot wood increases labor

efficiency over 4-foot wood 20 per cent and that this alone is a strong argument for a cord of 160 cubic feet.

F. W. Reed called attention to the fact that mine props are already being bought by weight.

P. R. Camp spoke of the need for standards in the measurement of timber, but he was of the opinion that the weighing of lumber and other forest products would be very unsatisfactory. He feels that there is great need for the establishment of log grades. His company is now buying logs on grade, but they are having difficulty in putting it across. He is strongly of the opinion that both the timber owner and the millman would benefit by cutting the larger logs and leaving the smaller timber for additional growth.

Mr. Gooch of the Hummel Ross Company discussed briefly the desirability of standards and pointed out some of the difficulties to be encountered in their use. He feels that legislation should provide that if wood is bought otherwise than by the standard cord the method of measurement should be stated in the contract.

The resolutions adopted expressed the thanks of the section to State Forester Holmes, his staff, other members of the Society in Raleigh, and Commissioner of Agriculture Graham; expressed appreciation to Charles Lathrop Pack for the valuable assistance he has rendered the forestry movement; requested Congress to appropriate the sums recommended to the Bureau of the Budget by the National Forest Program Committee under the McSweeney-McNary, Clarke-McNary, and McNary-Woodruff Laws; expressed sympathy to W. J. Damtoft and family in their recent be-

reavement; expressed best wishes and hopes for speedy recovery to Joseph Hyde Pratt and W. D. Tyler; urged directors of vocational agriculture in the Appalachian region to have forestry included in the curriculum in the high schools and to have their teachers make special preparation for teaching forestry; urged upon the other eastern sections of the Society that early steps be taken to arrive at an agreement upon the names and descriptions of the forest types found within the region; and expressed interest in the standardization of measurements of timber and other forest products.

JOHN W. MCNAIR,
Secretary.



ELECTION OF MEMBERS

The following men have been elected to the grade of membership indicated, effective January 1, 1929:

ALLEGHENY SECTION

Junior Membership

Carnegie, William A.
Heberling, Ralph B.
Holliday, James W. K.
Kuppe, Adolph J. W.
Wible, Ralph C.

APPALACHIAN SECTION

Junior Membership

Abell, Charles A.

GULF STATES SECTION

Junior Membership

Abbott, J. H.
Bennett, Frank W.
Gibbs, Frank J.
Gosnell, J. W.

Hartman, Arthur W.
 Mead, Ernest J.
 Ochsner, Herbert E.
 Pessin, L. J.
 Stauffer, Jacob M.

Groenewold, Carl A.
 Smith, Earl

INTERMOUNTAIN SECTION

Junior Membership

Becraft, Raymond J.
 Betensen, Blaine
 Buchenroth, Felix
 Gustofson, Carl A.
 Latham, Orrin L.
 Libby, Josiah A.
 Moore, Frank S.
 Nord, Arthur G.
 Olsen, Chester J.
 Shannon, Claude C.
 Storm, Earle V.
 Van Meter, Thomas H.
 Van Winkle, Harry H.
 West, J. William
 Wilde, Kenneth E.

Senior Membership

Arrivee, David A.
 Parkinson, Dana

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 Currier, H. R.
 Gottlieb, Albert W.
 King, Charles K.
 King, F. C.

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 Wheeler, William C.

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 Arnold, LeRoy D.
 Case, Paul C.
 Cory, Floyd W.
 Forward, Charles H.
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 Holbrook, Wellman
 Hutton, George W.
 Rotschy, Samuel
 Walling, Willoughby H.
 Zeh, W. H.

NORTHERN ROCKY MOUNTAIN SECTION

Junior Membership

Anderson, Bernard A.
 Blake, Clyde D.
 Bloom, Charles
 Buckingham, W. E.
 Cochrell, Albert N.
 Cossitt, Floyd M.
 Cramer, Albert J.
 Decker, Arlie D.
 Fitting, Ray R.
 Foltz, Frank
 Hand, Ralph L.
 Jefferson, Lorenzo F.
 Kumber, Charles G.
 Larsen, W. W.
 Lee, Bernard
 Lockhart, William E.
 Lommasson, Thomas
 Polleys, E. G.
 Rettig, Edwin C.
 Roemer, A. A.
 Schilling, Edwin A.
 Schwan, Herbert E.
 Simcoe, Philip S.

Smith, Harold Pitt

Tennant, Earl C.

Thompson, John Bernard

Toole, Arlie W.

White, Harold Z.

Wolf, Ernest T.

SOUTHEASTERN SECTION

Junior Membership

Oettmeier, William M.

Senior Membership

Hall, S. J.

Associate Membership

Humiston, W. D.

NOT AFFILIATED

OHIO VALLEY SECTION

Senior Membership

Dean, Forest W.

Kynoch, William

Junior Membership

Gross, Elroy H.

Maneja, Cecilio

ANNOUNCEMENT OF CANDIDATES FOR MEMBERSHIP

The following names of candidates for membership are referred to Junior Members, Senior Members, and Fellows for comment or protest. The list includes all nominations received since the publication of the list in the November JOURNAL, without question as to eligibility; the names have not been passed upon by the Executive Council. Important information regarding the qualifications of any candidate, which will enable the Council to take final action with a knowledge of essential facts, should be submitted to the undersigned before May 15, 1929. Statements on different men should be submitted on different sheets. *Communications relating to candidates are considered by the Council as strictly confidential.*

FOR ELECTION TO GRADE OF JUNIOR MEMBER

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Albright, Lewis Russell Penn. State, B. S. F., 1927; Yale, M. F., 1928	Forester, Pa. Dept. Highways, Reading, Pa.	Allegheny Sec.
Allan, John W. 3 years forestry, Ore. Agric. College, 1922	Senior Forest Ranger, Hoopa In- dian Reservation, Hoopa, Calif.	California Sec.
Austin, Lloyd College of Agric., Univ. of Calif., B. S., 1920	Director, Eddy Tree Breeding Station, Placerville, Calif.	California Sec.
Bartlett, Ilo H. Mich. State, B. S. F., 1926	Game Division, Michigan Dept. Conservation, East Lansing, Mich.	Ohio Valley Sec.
Bean, Leslie S. Colo. Agric. College, B. S. F., 1925	Sawbill Ranger District, Grand Marais, Minn.	Minnesota Sec.
Booth, I. S. Univ. of Mich., B. S. F., 1924	Forest Fire Div., Mich. Dept. Conservation, Lansing, Mich.	Ohio Valley Sec.

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Buckingham, H. C. Conn. Agric. College, B. S., 1925; Yale, M. F., 1927	District Forester, Cumberland, Md.	Allegheny Sec.
Carter, Linton A. Mich. State, B. S. F., 1924	District Forester, N. C. Dept. Conservation and Development, Windsor, N. C.	Appalachian Sec.
Cavill, J. C. High School; Wyman's School of the Woods, Munising, Mich., Degree Logging Engineer	Deputy Supervisor of Forests, Red Lake Indian Forest, Red Lake, Minn.	J. P. Kinney W. H. von Bayer E. Morgan Pryse
Conarro, R. M. Grammar school; special courses in math., business En- glish, corres., and land sur- veying	Ass't Forest Supervisor, Oua- chita National Forest, Hot Springs Nat'l Park, Ark.	Wm. L. Hall R. M. Evans L. L. Bishop
Correll, Lynne M. Iowa State, B. S. F., 1925	Ass't Forest Ranger, Stanislaus N. F., Sonora, Calif.	California Sec.
Crossley, Thomas 4 years high school; 20 years' practical experience	Chief Lumberman, Cœur d'Alene, Ida.	No. Rocky Mt. Sec.
Dearborn, Ned Dartmouth, B. S., 1891; N. H. College, M. S., 1898; N. H. College, D. Sc., 1901	Ass't Prof., School of Forestry and Conservation, Ann Arbor, Mich.	Ohio Valley Sec.
Deen, Joshua Lee Univ. of Minn., B. S. F., 1927	Working for M. F. degree at Yale School of Forestry, New Haven, Conn.	Minnesota Sec.
Dinehart, Peter M. Graduate N. Y. St. Ranger School, 1914	Senior Ranger, U. S. Indian Ser- vice, Wellpinit, Wash.	J. P. Kinney W. H. von Bayer E. Morgan Pryse
Garman, Eric H. Oregon State, B. S. F., 1927; Yale, M. F., 1928	Research Assistant, B. C. Forest Service, Victoria, B. C.	J. W. Toumey R. C. Hawley H. H. Chapman R. C. Bryant
Gilmour, John Douglas Ont. Agric. College, B. S. A., 1908; Univ. of Toronto, B. Sc. F., 1911	Director, Anglo-Newfoundland Development Co. and Anglo- Canadian Pulp & Paper Mills, Quebec City, Que.	Ellwood Wilson Clyde Leavitt C. D. Howe
Gray, Patrick L. Private study, logging engi- neering	Deputy Supervisor of Forests, Warm Springs, Ore.	J. P. Kinney E. Morgan Pryse W. H. von Bayer
Hatch, Alden B. Univ. of Idaho, B. S. F., 1928	On Furlough	No. Rocky Mt. Sec.
Holst, Monterey L. Oregon State, B. S. F.	Forest Ranger, Cascade Nat'l Forest, Westfir, Ore.	North Pacific Sec.
Howard, Fairman S. N. Y. State Col. Forestry, B. S. F., 1927	Forester, Quinebaug Forestry Co., Southbridge, Mass.	Ohio Valley Sec.
Hutchins, Maxwell C. Common school education; 25 years practical experience (Asso. Member, March, 1922)	State Fire Warden, Mass. Dept. Conservation, Boston, Mass.	New England Sec.

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Kemp, Paul D. Penn. State, B. S. F., 1926	Research fellowship, Univ. of Idaho, Moscow, Ida.	No. Rocky Mt. Sec.
Kilp, Frederick George Graduate forest ranger course, Univ. of Wisconsin, 1915	Forester, Nekoosa Edwards Paper Co., Port Edwards, Wis.	Wisconsin Sec.
Kneeland, Paul D. Hamilton, A. B., 1909; Harvard Univ., M. F., 1912	President, Kneeland-Morrill Lumber Co., Worcester, Mass.	New England Sec.
Kolbe, Ernest L. Univ. of Minn., B. S. F., 1927; Cornell Univ., M. F., 1928	Junior Forester, Pacific N. W. Forest Exp. Station, Portland, Ore.	North Pacific Sec.
Kopenhaver, Ralph W. Univ. of Calif., B. S. F., 1927	Ass't Forest Ranger, Eldorado Forest, Georgetown, Calif.	California Sec.
Lotti, Thomas Univ. of Minn., B. S. F., 1927	Temp. Ass't, Lake States Forest Exp. Sta., St. Paul, Minn.	Minnesota Sec.
Luther, Thomas F. Phillips-Exeter Academy, 1914; special student forestry, Cornell Univ., 1914-1916	Assisting father in management Luther Forest Reserve, Saratoga, N. Y.	C. H. Guise Joshua A. Cope J. Nelson Spaeth Ralph S. Hosmer S. N. Spring A. B. Recknagel John Bentley, Jr. H. J. Andrews Wm. L. Barker, Jr. H. R. Sayre E. V. Jotter
McIntire, George S. Iowa State, B. S. F., 1926	Michigan Land Economic Survey, Lansing, Michigan.	California Sec.
Mirov, Nicholas T. Graduated Institute of Forestry, St. Petersburg, Russia, 1916	Field Assistant, Calif. Forest Exp. Station, Hilgard Hall, Berkeley, Calif.	
Morris, Elliston P. Haverford College, B. S., 1922; Yale, M. F., 1928	Junior Forester, U. S. F. S., West Yellowstone, Mont.	Henry S. Graves No. Rocky Mt. Sec.
Nelson, Stanley C. Univ. of Minn., B. S. F., 1927	Student Ass't, Forest Products Laboratory, Madison, Wis.	Wisconsin Sec.
Norton, Henry E. Yale Univ., B. A., 1922; Univ. of Calif., 1½ years in forestry, 1927	Ass't Forest Ranger, Plumas Forest, Quincy, Calif.	California Sec.
Norton, Newell A. Brown Univ., Ph. B., 1925; Yale, M. F., 1928	Junior Instructor in Forestry, Univ. of Mich., Ann Arbor, Mich.	Henry S. Graves J. W. Toumey R. C. Bryant R. C. Hawley H. H. Chapman
Oliver, Donald A. Michigan State, B. S., 1927	Junior Forester, U. S. F. S., Parsons, W. Va.	Allegheny Sec.
Parker, Alvin L. Oregon State, B. S. F., 1927	Ass't Forest Ranger, Stanislaus Forest, Sonora, Calif.	California Sec.
Peterson, W. A. Biltmore Forest School, B. F., 1913	District Forest, N. C. Forest Service, Fayetteville, N. C.	Appalachian Sec.

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Pike, Joseph B. Univ. of Maine, B. S. F., 1927; Yale, M. F., 1928	District Forester, State Dept. of Forestry, Hartford, Conn.	Henry S. Graves New England Sec.
Roberts, Kenneth L. Cornell Univ., B. S. F.	Ass't Forester, Finger Lakes State Parks Commission, Ithaca, N. Y.	New York Sec.
Robinson, Cyril S. England, private schols, 1905; 3 years Univ. of Calif. in for- estry, specializing in range management	Junior Range Examiner, Lassen Forest, Susanville, Calif.	California Sec.
Rowe, Percy B. Univ. of Idaho, B. S. F., 1928	Junior Forester, Office of Blister Rust Control, U. S. D. A., Spo- kane, Wash.	No. Rocky Mt. Sec.
Sanders, A. Leslie Univ. of Wash., B. S. F., M. F., 1925	Forester, Timber Products Co., Cogdell, Ga.	Southeastern Sec.
Sharp, Andrew Given Cornell Univ., B. S. F., 1928	Research Fellow in Forestry, Univ. of Idaho, Moscow, Ida.	No. Rocky Mt. Sec.
Skellenger, Laurence E. Mich. State, B. S. F., 1926; Yale, M. F., 1927	Forester, Cleghorn Corporation, Cleghorn on Wye, Longwoods, Md.	Allegheny Sec.
Spaulding, Clarence K. Univ. of Mont., B. S. F., 1928	Forest Ranger, Missoula N. F., Missoula, Mont.	No. Rocky Mt. Sec.
Turnbull, George A. N. Y. State Col. Forestry, B. S. F., 1920	Forestry Teacher, Los Angeles City Schools, Los Angeles, Calif.	Franklin Moon R. P. Prichard Raymond J. Hoyle F. S. Baker California Sec.
Zaayer, C. V. Univ. of Wageningen, Hol- land, M. F.	Logging Engineer, Calif. Door Co., Diamond Springs, Calif.	

FOR ELECTION TO GRADE OF SENIOR MEMBER

Bode, Irwin T. Iowa State, B. S. F., 1915; M. S. F., 1920 (Junior Member 1924)	Extension Forester, Iowa State College, Ames, Iowa.	Minnesota Sec.
Chapler, R. H. Willamette Univ.; 2 yrs. Univ. of Calif.; Oregon Agric. Col- lege, B. S. F., 1914 (Junior Member 1925)	Forester, Western Forestry & Conservation Association, Port- land, Ore.	North Pacific Sec.
Day, Ralph K. N. Y. State Col. Forestry, B. S. F., 1922; Univ. of Mon- tana, 1922-23 (Junior Member 1924)	Ass't Silviculturist, Central States Forest Exp. Station, Ohio State University, Columbus, Ohio.	Ohio Valley Sec.
Deam, Charles C. 2 yrs. DePauw University; Hon. A. M., Wabash College (Junior Member 1924)	Research Forester, Dept. of Con- servation, Bluffton, Ind.	Ohio Valley Sec.

<i>Name and Education</i>	<i>Title and Address</i>	<i>Proposed by</i>
Hammer, George Conrad Univ. of Mich., A. B., 1914; M. S. F., 1915	Manager, Menominee Indian Mills, Neopit, Wis.	Wisconsin Sec.
Herbert, Paul Anthony Cornell, B. S., 1921, M. F., 1922; additional graduate work in economics and botany, Mich. State (Junior Member 1924)	Research in forest taxation, Marsh Hall, New Haven, Conn.	C. H. Guise Ralph S. Hosmer Samuel N. Spring J. Nelson Spaeth A. B. Recknagel
Jotter, Walter E. Univ. of Mich., B. S. F., 1916 (Junior Member 1921)	Assistant Forester, Sierra National Forest, Northfork, Calif.	California Sec.
Meyer, Walter Huber Yale, M. F., 1922; Royal In- stitute Forestry, Stockholm, 1922. (Junior Member 1924)	Associate Silviculturist, Pacific N. W. For. Exp. Sta., Portland, Ore.	North Pacific Sec.
O'Neil, William James Oregon State, B. S. Logging Engineering, 1917 (Junior Member 1925)	Sec.-Treas., O'Neil-Carney Lbr. Co., Chicago, Ill.	Ohio Valley Sec.
Sayre, Howard R. Mich. State, B. S., 1923 (Junior Member 1925)	Ass't State Forester, Lansing, Mich.	Ohio Valley Sec.
Siggins, Howard W. Mont Alto Forest Academy, 1914; Univ. of Calif., M. S. F., 1925. (Junior Member 1926)	Ass't Silviculturist, Calif. Forest Exp. Sta., Berkeley, Calif.	California Sec.
Telford, C. J. Sheffield Scientific School, B. S., 1913; Yale, M. F., 1915 (Junior Member 1923)	Extension Forester, Urbana, Ill.	Ohio Valley Sec.
Wagener, Willis W. Stanford Univ., 3½ years, A. B.; Univ. of Calif., post- graduate study in forestry, M. A. (Junior Member 1922)	Ass't Pathologist, Office of Forest Pathology, San Francisco, Calif.	California Sec.
Wilcox, Ralph F. Penn. State Forest School; graduate Cornell Univ. (Junior Member 1927)	State Forester of Indiana, In- dianapolis, Ind.	Ohio Valley Sec.

FOR ELECTION TO GRADE OF ASSOCIATE MEMBER

Wight, Howard M. Bates College, B. S., 1915; Oregon State, M. S., 1917	Ass't Professor Forest Zoology, School of Forestry and Conser- vation, Univ. of Mich., Ann Arbor, Mich.	Ohio Valley Sec.
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Member of Executive Council in Charge of Admissions.

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A. C. Cline, Secretary, Harvard Forest, Petersham, Mass.

New York

Samuel N. Spring, Chairman, Cornell University, Ithaca, N. Y.
J. Nelson Spaeth, Secretary, Cornell University, Ithaca, N. Y.

Northern Rocky Mountain

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William F. Ramsdell, Member of Executive Committee, Box 4137, Portland, Ore.
E. J. Hanzlik, Secretary, Box 4137, Portland, Ore.

Ohio Valley

C. J. Telford, Chairman, 504 N. Romine St., Urbana, Ill.
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Portsmouth, Ohio.

Southeastern

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W. M. Oettmeier, Fargo, Ga.

Southwestern

Hugh G. Calkins, Vice-Chairman, U. S. Forest Service, Albuquerque, N. M.
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Washington

George P. Ahern, Chairman, Woodley Apartments, Washington, D. C.
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R. E. Marsh, Member of Executive Committee, Forest Service, Washington, D. C.

Wisconsin

R. D. Garver, Chairman, Forest Products Laboratory, Madison, Wis.
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